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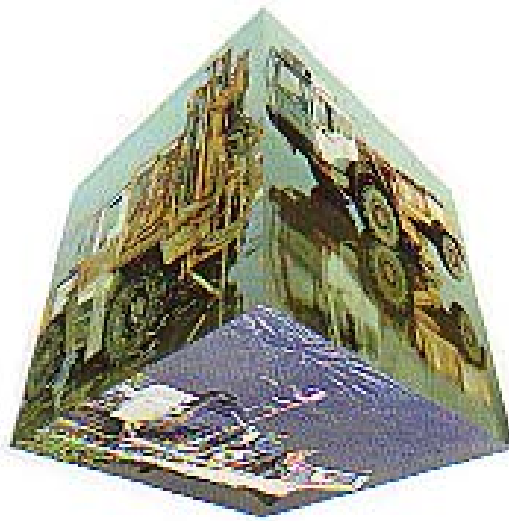
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1. Preface



1 PREFACE

Everyone involved in the geophysical industry is accountable to themselves, their families, their fellow workers, their employers and their clients to work in a safe and responsible manner, follow established rules, comply with local regulatory requirements and follow their company's policy.

All personnel should challenge and report all unacceptable HSE situations, incidents, (accidents and near misses), whenever or wherever they occur, to their supervisor.

Always Remember: *Common Sense Is Not So Common.*

Do not expect others working with and around you to always see potential hazards the same way. All geophysical personnel should work together and communicate their experiences and knowledge to ensure there is a shared perception of the risks.

The quality of the geophysical industry's work is dependent on our skilled and experienced personnel. Accidents deplete this invaluable resource. The IAGC hopes that the use of this manual will lead to greater HSE awareness throughout the industry and improve performance for all operators.

The IAGC encourages all employees to read this manual and to become familiar with its content.

1.1 Purpose

Geophysical operations are hazardous. The objective of this manual is to highlight areas of concern and to provide industry best practice guidance to manage risks in the workplace.

We have attempted to make the manual as user friendly and as complete as possible. However, it is intended as a supplement to and not a replacement for, the internal HSE policies and procedures used by companies to control and mitigate all hazards at all work locations.

Additional guidance on specific topics may be found in the material noted in the references section of this manual.

Geophysical companies throughout the industry are expected to comply with all applicable laws, regulations and permit conditions while applying prudent operating practices and procedures in the conduct of their work.

The IAGC does not represent that this or any other edition of the IAGC Marine HSE Manual is entirely comprehensive, accurate or covers each and every HSE topic or risk, which may be encountered by those using this manual and disclaims all responsibility and liability for any such utilization of the manual by the users thereof. By receipt of the IAGC Marine Geophysical HSE Manual, the recipient or user agrees to release, indemnify and defend the IAGC from and against any and all claims, demands and liabilities that may arise from the utilization of the manual by such recipients or users.

Additional copies of this manual can be obtained from: www.iagc.org

1.2 Scope

This manual is designed as a guide for geophysical field operations. The collective worldwide incident experience of many geophysical operators and their clients provides the underpinning of the content, which has been organized in such a way that individual HSE subjects can be addressed at HSE meetings and/or HSE training sessions.

1.3 Definitions

Throughout this manual, terms and definitions are used in accordance with the OGP Glossary of HSE Terms. If you are in doubt of the meaning of a word or term in any part of this manual, ask your supervisor to advise you.

1.4 References

- **International Association of Geophysical Contractors (IAGC)**
 - **Land Marine Operations Safety Manual, tenth Edition.**
 - **Environmental Manual For Worldwide Geophysical Operations (Millennium Edition)**
 - **Guidelines on the use of Workboats in Marine Geophysical Operations**

- **The International Association of Oil and Gas Producers (OGP) (formerly E&P Forum)**
 - **HSE aspects in a contracting environment for geophysical operations - OGP reference 432**
 - **M1 Guidelines for the development and application of health, safety and environmental management systems - OGP reference 6.36/210**
 - **M2 HSE Management: guidelines for working together in a contract environment - OGP reference 6.64/423**
 - **M3 HSE competence assessment and training guidelines for the geophysical industry - OGP reference 6.78/292**
 - **M4 Guidelines for HSE auditing in the geophysical industry - OGP reference 6.53/245**
 - **H1 Managing Health For Field Operations In Oil & Gas Activities - OGP reference 343**
 - **H1 Substance Abuse: A Guide For Managers And Supervisors In The Oil And Gas Industry- OGP reference 445**
 - **H5 Guidelines for the control of HIV, Hepatitis B and C in the workplace - OGP reference 6.55/321**
 - **H6 Health aspects of work in extreme climates - OGP reference 398**

- S1 Aircraft management guidelines - OGP reference 390
- S2 Watercraft & water in geophysical operations – a guide to operations and management – OGP reference 355
- S3 Land transportation safety recommended practice - OGP reference 365
- S4 Guidelines on permit to work systems - OGP reference 6.29/189
- E1 Environmental management in oil & gas exploration & production- OGP reference 2.72/254
- E2 Oil & gas exploration & production operations in mangrove areas - guidelines for environmental protection - OGP reference 2.54/184
- E3 Oil industry operating guideline for tropical rainforests - OGP reference 2.49/170
- E4 Oil & gas exploration & production in arctic offshore regions - guidelines for environmental protection - OGP reference 329
- E5 Guidelines for Waste Management - OGP reference 413
- OGP Human Factors
- Oil & Gas UK (formerly UK Offshore Operators Association, UKOOA):
 - Guide for NGO Interference.
- Step Change in Safety
 - Task Risk assessment Guidelines
 - Guidance for Health and Safety Management Interfacing
- International References
 - International Management Organization (IMO)
 - International Safety Management Code (ISM)
- SOLAS condensed Text 1986 of 1974 SOLAS Convention, 1978 Protocol and the 1981, 1983, 1989 and 1991 Amendments.
- MARPOL regulations.
- ISO 9000
- ISO 14000

- **OHSAS 18001 ATA, Federal Motor Carrier Safety Regulations, 1988**
- **UK Department of Transport, Code of Safe Working Practices for Merchant Seamen, 1990**
- **Bureau of Alcohol, Tobacco and Firearms (BATF), Explosives Law and Regulations**
- **Occupational Safety and Health Administration (OSHA), Safety and Health Standards, 29 CFR, 1926/1910**
- **Department of Transport (DOT), Hazardous Materials Regulations, 1983**
- **U.S. Code of Federal Regulations (CFR)**

1.5 Acknowledgments

This tenth edition of the IAGC Marine Safety Manual for Geophysical Field Operations would not have been possible without the dedicated work of numerous geophysical industry representatives, including both operating managers and safety professionals from throughout the world.

The result is a comprehensive safety manual that should provide invaluable assistance to companies and individuals who wish to ensure the highest degree of safety in their field activities. We hope the manual, in conjunction with the other safety initiatives and programs offered by our association, will lead to greater safety awareness throughout the industry and to improved safety performance.

To the following individuals and companies, we offer our sincere appreciation and commendation for a job well done:

Brian Thorne	Petroleum Geo-Services
Vicki Huebler	ION Geophysical
Roger McKellar	Geokinetics
Allan Makenzie	Fugro Geoteam
Scott Platz	Neos Geosolutions
Graham Nicholls	CGGVeritas
Daniel Chang	BGP
Pablo Colman	WesternGeco
Mike Covil	Technical Editor

The IAGC is sad to say goodbye to a longtime friend and colleague Mike Covil. During his career in SSL, Mike worked as a field technician, party chief and later as a regional manager. He then took over the chief HSE role in SSL for several years working globally. When he retired, he became what some would call the “the UK based arm of IAGC” for many years and contributed significantly to many IAGC activities, including various revisions of this manual through its development to date. He also shared his knowledge through consulting and training, not least a short period in China presenting courses with me where he was highly respected for his knowledge, experience and never ending enthusiasm.

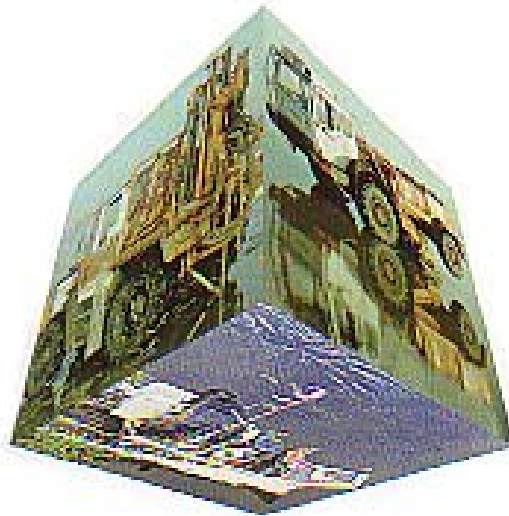
Jay Friberg (RPS Energy) Technical Editor

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Bernard Marley	WesternGeco		

Special thanks to Dr. Alex Barbey, Schlumberger for providing the First Aid update materials.

2. HSE Management Systems



2 HSE MANAGEMENT SYSTEMS

HSE management systems are now a major part of the Geophysical industry's efforts to avoid incidents. Typically the HSE management system comprises of an overall Company system, incorporating the Crew and Project specific HSE plans which are sometimes combined.

The major elements of an HSE Management System are:

- Leadership & Commitment
 - Top down commitment and company culture.
- Policies & Objectives
 - Corporate intentions, principles of action and aspirations with respect to HSE.
- Organization, Resources, and Documentation
 - Organization of people, resources and documentation for sound HSE performance.
- Risk management
 - Identification and evaluation of HSE risks, for activities, products, and services, and development of risk reduction measures.
- Planning
 - planning the conduct of work activities including planning for changes and emergency response.
- Implementation & monitoring
 - Performance and monitoring of activities, and how corrective action is to be taken when necessary.
- Audit, Review and Improvement
 - Periodic assessments of system performance, effectiveness and fundamental suitability.

Vessel operators are also required to comply with the International Safety Management (ISM) Code - The purpose of this Code is to provide an international standard for the safe management and operation of ships and for pollution prevention. The ISM code is essentially a maritime HSE management system, which includes the above elements in order to implement appropriate organization of management, ashore and on board to ensure adequate standards of safety and pollution prevention. The main objective of ISM code is compliance with mandatory rules and regulations related to the safe operation of ships and protection of the environment emphasizing the responsibility of the Master in relationship to onshore management, the need for emergency preparedness and the avoidance of pollution.

The Administration is responsible for verifying compliance with the requirements of the ISM Code and for issuing Documents of Compliance to Companies and Safety Management Certificates to ships. All personnel should make themselves familiar with their own Company's HSE management system.

This manual highlights some of the key aspects.

2.1 Basic HSE Training

2.1.1 Minimum Safety Training

Each company shall have a defined minimum level of training for all personnel. The employee should have completed this minimum training before traveling offshore.

It is recommended that all persons traveling or working offshore shall have attended a Basic Offshore Sea Survival (BOSS) training course. If a possible means of travel to/from the crew utilizes helicopter transport, then it is also recommended that a Helicopter Underwater Escape Training (HUET) course also be attended.

Refer to STCW 95 for other specific minimum training required by maritime personnel.

HSE Induction and Orientation

All persons joining or visiting a geophysical vessel should be taken on an HSE induction tour through the vessel. This should happen within 24 hours or before a vessel sails from port whatever comes first and as a minimum should include:

1. The layout of the vessel including the location and operation of safety equipment, first aid kits, alarm points and muster stations.
2. Explanation of emergency alarms, procedures and safety regulations.
3. An explanation of the ships muster list (station bill) and its location.
4. Where the life jackets and immersion/survival suits are stowed and where personal escape equipment such as smoke hood, torch, etc. are located.
5. Which muster station they should report to in the event of an emergency.
6. The written safety orientation sheet (given to each person).
7. Ensure that each person has adequate Personal Protective Equipment (PPE) and if visiting the back or working decks of the vessel, they be issued with a Personal Flotation Device (PFD).
8. As a part of the induction process onboard, each crewmember shall read the following two vessel specific manuals that are mandatory to carry onboard vessels:
 - a. SOLAS Training Manual
 - b. Fire Fighting Training Manual

For all permanent employees joining the vessel, this induction should also include:

1. Chain-of-command and key personnel.
2. Station and duties in case of emergency.
3. Job and associated hazards.
4. Safety rules and reporting procedures.
5. Company HSE policies.
6. Explanation of security levels (ISPS) and any security duties if required
7. Site specific training as required
8. A next of kin and medical information sheet should also be filled in

Induction refresher training is recommended for permanent personnel after maximum 2 years.

When in port, temporary visitors should be given an HSE briefing. They should be advised in case of an emergency onboard to leave the ship immediately and report to the muster area on the quay where everyone will be accounted for. All temporary service personnel and visitors should be accompanied by qualified ship's personnel.

2.2 HSE Meetings

Toolbox meetings for work units and skill pools should be held any time there is a question about the immediate task or at the start of any HSE critical operation. A risk assessment should be conducted when necessary.

The meetings should be short and to the point.

Short meetings of 15-20 minutes duration should be conducted frequently to discuss incidents, as well as unsafe acts or conditions noted by the crew.

Active participation or role-playing may be required at HSE meetings where there is a demonstration or video of safety equipment.

Longer regularly scheduled, well-planned meetings should be held to discuss new material and subjects not adequately covered at the shorter meetings. A report of these meetings, with attendance records, should be maintained.

IAGC has extensive HSE materials that would be helpful to you in these meetings. Please see URL for IAGC homepage: <http://www.iagc.org/default.asp>

2.3 Incident Reporting

All accidents, incidents, near misses, hazardous situations, unsafe acts and conditions should be reported as per your company procedures, client or regulatory requirements.

All reports should be analyzed and actioned. Reports referring to serious accidents and reports referring to incidents with high potential risk shall be investigated, reviewed, and actioned in an effort to prevent future occurrence of a similar event.

2.4 Auditing and Improvement

Crews should be audited on an internal basis to ensure adherence to your company systems, policies, standards, guidelines, work instructions, and processes. Any deficiencies or non-compliances should be actioned and corrected as part of a remedial work program.

Clients may conduct external audits to ensure compliance with their HSE Management System requirements.

Vessel operators will be audited by classification societies on behalf of the flag state in order to demonstrate compliance with ISM and ISPS codes as required.

2.5 General HSE

Marine geophysical operations must be carried out in a safe manner. Be sure to request and receive an HSE briefing upon joining a vessel. Your IAGC, OGP or company Personal Training Passport should be submitted to the Master of the vessel for his dated signature upon completion of an HSE briefing.

The main points to observe are:

1. Responsibility for the vessel and all personnel aboard is firmly vested in the Master. For the purpose of this manual, the Master and Captain is the same person.
2. Responsibility for seismic equipment and geophysical operations lies with the Party Chief, in agreement with the Master.
3. Each individual is responsible for the safety of himself and his shipmates.
4. Established HSE procedures must be followed by the geophysical personnel and visitors, as well as by the ship's crew. Training and experience in following these procedures are of the utmost importance.
5. On board a geophysical vessel, the crew eats works and sleeps in close proximity to materials such as flammable gases, cable oil and possibly explosives. Thus, the safe practices of each individual directly affect the lives of all others. There is no margin for error. Safe procedures must be followed.
6. The safe procedures for storing and using gases and flammable liquids must be followed. Following these procedures with a constant alertness to unsafe practices can protect your life and those of your shipmates.
7. Learn from your HSE orientation and the Emergency drills where to go in an emergency and the procedures to follow.
8. Drills to familiarize the crew with the safety equipment and its use shall be held. These will include practice using equipment and rehearsal of possible scenarios.

9. In case of an emergency, crew assignments will be in accordance with the posted muster list (station bill). The stations and emergency duties of all personnel will be posted in conspicuous public locations around the vessel. All cabins should have emergency stations, emergency signals and escape routes posted for the occupants.
10. When docked, a safe gangway with a handrail on at least one side should be used. A safety net should be placed under the gangway. Do not board by any other route other than the gangway and then only when the gangway has been fully rigged and installed by the ship's crew.
11. Persons or supplies should be transferred from one ship to another only under well-controlled conditions and only on the authorization of both Masters.
12. When working in the vicinity of rigs or platforms, regular communications should be maintained between all parties concerned.
13. Know the correct procedures for securing watertight doors. Keep the door and hatch gaskets clean and free of paint in order to maintain watertight integrity.
14. Good housekeeping and preventative maintenance are essential for the prevention of incidents and your well-being. Keep all areas and equipment clean of debris, dirt and loose objects.
15. Keep all, stores and equipment properly stowed and secured.
16. Clean up all spills or leaks of oil, diesel fuel, cable oil or other materials immediately in an environmentally accepted manner.
17. Keep inboard of rails while aboard ship. Do not sit on gunwales, rails or place hands on rubbing strakes.
18. Stand clear of ropes, lines or cables under tension which might break and cause serious injury. Never stand in the bight (loop) of any rope line or cable.
19. Ensure that ropes, lines, cables and wires are in good order and that force in excess of approved limits is not applied. Ropes must be routed around suitable rollers and sheaves.
20. Do not work without appropriate PPE. Use life or safety lines when appropriate. Only proper safety footwear (oil resistant and steel toe-capped) should be worn in back deck & heavy equipment areas. Sandals or shower shoes (flip flops) should not be worn outside the accommodation area.
21. Do not go on deck alone in rough sea conditions or in the dark. Always employ the "Buddy System" and tell other personnel where you are going and for how long.
22. Know the location of all emergency gear and equipment in your area, e.g., fire hoses, fire extinguishers, fire axes, life jackets, life rings, life rafts, flashlights and emergency lanterns, first aid kits, etc., and be familiar with their operation and use. Observe all WARNING SIGNS on the vessel.
23. Do not run – Mind the steps and hold handrails in staircases.

24. All types of knives are hazardous – Use only the right tool for the right task.

25. Five knots which everybody onboard should master.

2.6 Common Knots

2.6.1 Clove Hitch

1. Pass the end of the rope around a spar.
2. Then pass it over itself and over and around the spar.
3. Pass the end under itself and between the rope and spar
4. Tighten



2.6.2 Round Turn and Two Half Hitches

This reliable knot is quickly tied and is the hitch most often used in securing, if you complete it properly it will always release easily. To tie:

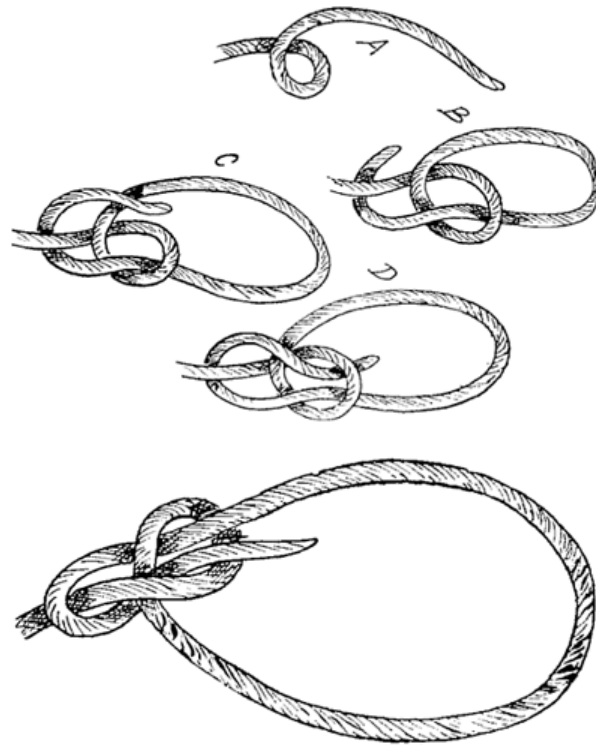
1. Pass end of rope around post or other object twice.
2. Wrap short end of rope under and over long part of rope, pushing the end down through the loop. This is a half hitch.
3. Repeat on long rope below first half hitch and draw up tight.



2.6.3 Bowline

This knot is used when a loop that doesn't jam or slip is required and it can be used for rescue.

1. Make the overhand loop with the end held toward you, then pass end through loop.
2. Now pass end up behind the standing part, then down through the loop again.
3. Draw up tight.

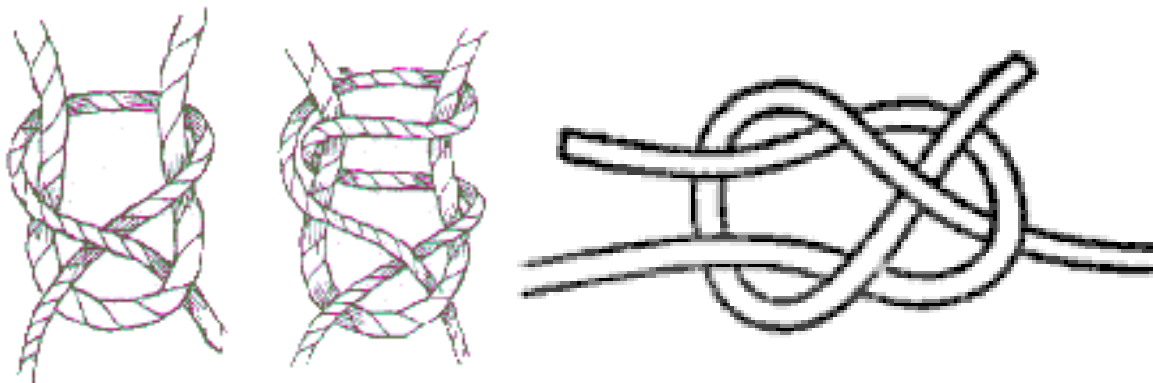


2.6.4 Sheet Shank/Bend.

This knot is used for joining ropes of different diameters.

Pass the end of one rope through the bight of another

Go around both parts of the other and under its own standing parts



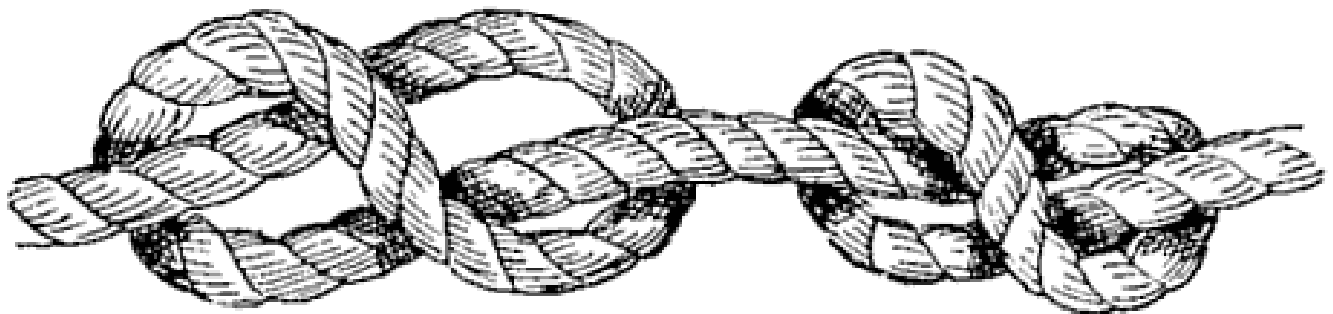
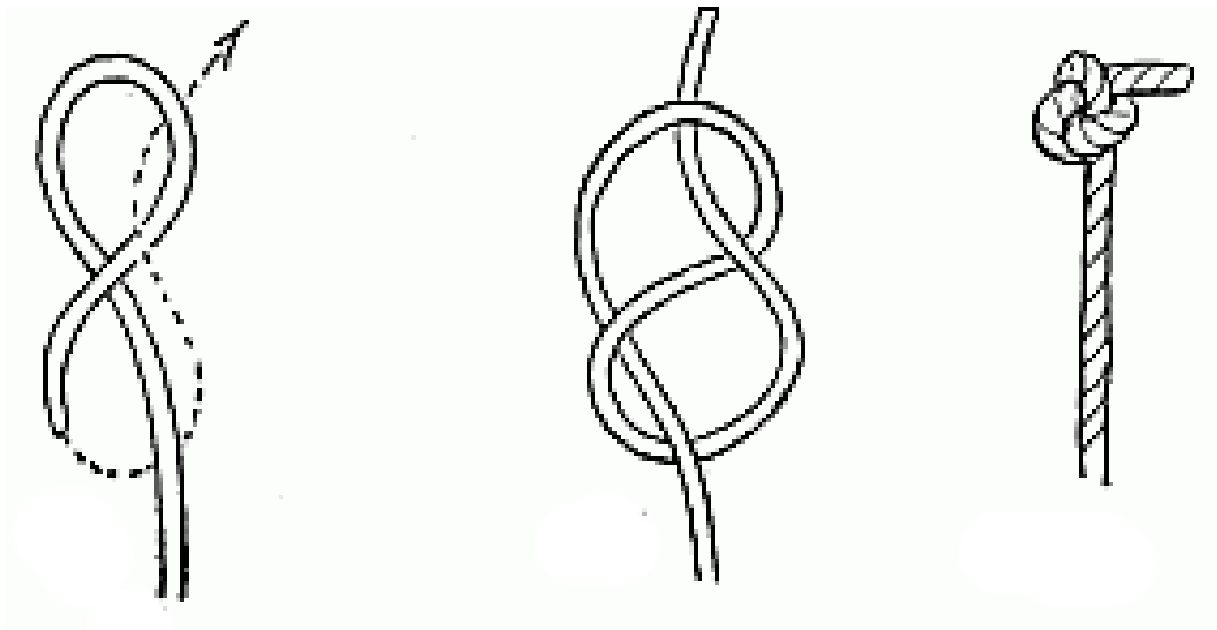
2.6.5 Figure of Eight

Cross the end of the rope over the top of the remaining rope making a q shape.

Pinch the top of the loop and twist it away from the tail of your q.

Pull the end of the rope or the tail of the q up through the upper loop from behind.

Pull both ends of the rope to tighten forming a figure eight.



3. HUMAN FACTORS



3 HUMAN FACTORS

Human factors is the term used to describe the interaction of the workers with each other, with facilities and equipment, and with the HSE Management System. This interaction is influenced by both the working environment and the culture of the people involved. What may be a good system of work in one region may be found to be less than ideal in an area where culturally driven attitudes to risk taking may be significantly different.

It is now more important than ever to consider Human Factors in all geophysical operations as this helps us to better identify, control & mitigate the potential hazards in each project. Below is a description of how we have progressed in the industry in reducing incidents.

1. The **first stage** of incident prevention in the industry was to engineer good design into specific tasks, (e.g. the use of automated systems to reduce the number of individuals required to accomplish a task.)
2. The **second stage** was to develop HSE Management Systems to reduce risks to as low as is reasonably practical (ALARP). This was achieved by establishing and implementing, well-documented procedures, training programs, conducting resource reviews, and developing effective incident reporting systems to learn from our mistakes.
3. The **third stage** now is to incorporate Human Factors and consider human behavior. From an individual's standpoint the third stage is the most important because it is here that all personnel become more aware of their interactions with the HSE Management Systems & take responsibility for their own actions and the actions of others around them, in an effort to promote teamwork and a safer work environment. Individual behavior turns the HSE Management System into a functional reality.

At this third stage situational awareness is the driving force in preventing incidents.

It is important to note that this does not place all responsibility on the individual. Management still has a responsibility to provide a safe working environment for the crew at all times.

3.1 Improving HSE Performance

The geophysical industry has been successful in reducing incident frequency by adopting improved engineering solutions and HSE Management Systems but HSE performance has reached a plateau in many companies.

The graph below shows how the rate of incidents in the industry has been reduced over time as described in the three steps listed above.

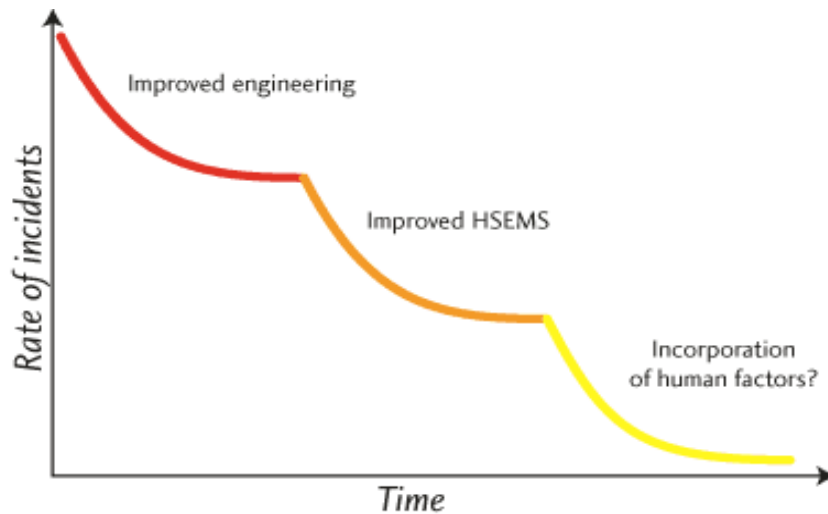


Figure 1 - Graph from OGP Human Factors

Continued progress will come by taking better and more explicit account of the way we interact with every aspect of the workplace and how these interactions may create hazards.

We need to consider how we interact with each other, facilities, equipment, and management systems we are working with. All of this, in turn, should also be understood within the context of the local culture and environment we are working in.

Below is a list of issues that should be considered when evaluating Human Factors on a crew:

Are procedures & written work instructions being used and referenced or are they just sitting on a shelf in a binder? Are these documents used for discussion for planning work activities? Are simple checklists available as an aide memoire?

Does the crew have adequate knowledge, training and experience to operate the equipment they are using? Are there competency checks for operating safety critical equipment?

Do risk assessments conducted prior to work activities identify?

- hazards that exist in within the system that is being worked on
 - i.e. stored energy, motion, chemical, radiation, electrical, gravity, heat / cold, biological, pressure
- hazards that workers introduce into a work environment
 - i.e. tools, equipment, untrained personnel, fatigue
- hazards that the surrounding working environment presents
 - i.e. simultaneous operations, wind, weather, ambient light
- Are there elements with people working together? .Are there communication issues with coworkers, maybe a language or cultural barrier preventing the flow of important information such as a shift turnover or interpreting instructions? Recognizing and then acting on communication issues with others will help prevent errors. Again, awareness is the key

These types of factors, unless recognized, have the potential to have a negative outcome on the HSE performance of the crew.

Educating the crew and creating an awareness of how these factors influence ones decision making process is the first step. Putting this tool into the hands of the crew to practically apply this concept will reduce errors and help prevent incidents.

Below is a diagram that shows the relationship of the three elements that should be evaluated.

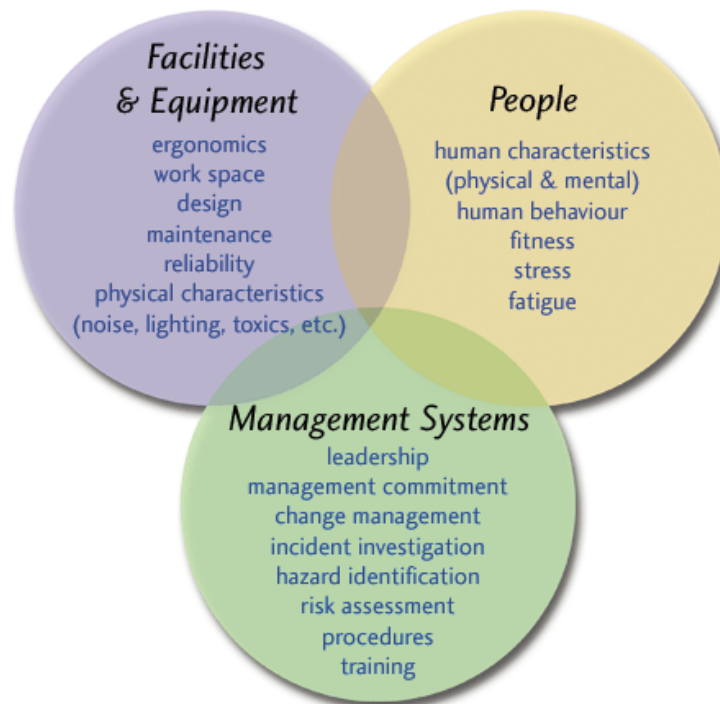


Figure 2 - OGP Human Factors

3.2 HSE Culture

Culture can be defined as shared set of beliefs of what is important and a belief in how things work in the company or on a specific crew. The goal for any geophysical company is to promote proactive behavioral norms (*it's the way we do things around here*¹). Management commitment and leadership is the primary driver behind this, generating employee involvement with shared responsibility based on open and honest communication.

¹ OGP Human Factors.

HSE Culture has a major impact on personal behaviors. The challenge for each team is to recognize its own safety culture and identify how it may be improved over time.

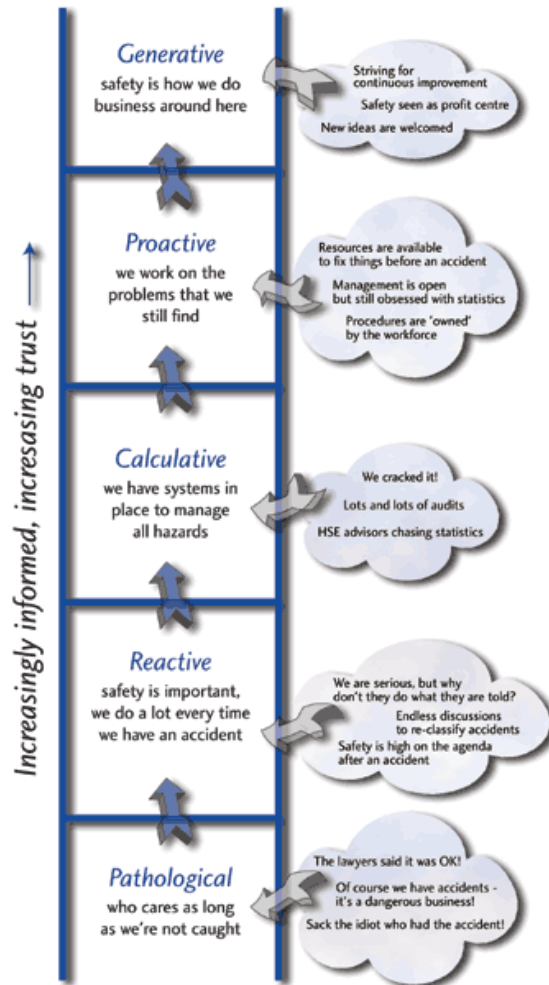


Figure 3 - OGP HSE Cultural Ladder

The HSE Culture Ladder is often used to help identify Human Factor issues and determine what steps should be taken to move the group as a whole to a higher level.

One extreme (pathological) displays a failure and lack of willingness to recognise and/or address issues which may result in poor HSE performance.

At the other extreme (generative) safe working practices are viewed as a necessary and desirable part of any operation.

On any geophysical operation there may be a range of different behavioural levels between different groups and teams, I.E different subcontractors & different position levels of the workforce.

The goal is to determine where each group sits on the ladder and take steps to improve HSE Culture to the next level for each.

Below is a guide on how to present HSE Cultural expectations at the crew level

EVERYONE

<i>Follow Rules</i>	<ul style="list-style-type: none"> • Learn relevant local standards, rules and procedures.
	<ul style="list-style-type: none"> • Strictly follow rules, and always uses the right procedure for the job.
	<ul style="list-style-type: none"> • Demonstrate excellent personal HSSE behavior.
	<ul style="list-style-type: none"> • Identify impractical rules and procedures, and promptly suggests improvements to Supervisor.
<i>Speak Up</i>	<ul style="list-style-type: none"> • Ask questions to gain clarification and understanding; listen to others' views and concerns.
	<ul style="list-style-type: none"> • Promptly report incidents, near-misses, unsafe conditions and error sources.
	<ul style="list-style-type: none"> • Express any HSSE concerns to Supervisor, including when unfit to work for any reason.
	<ul style="list-style-type: none"> • Challenge any unsafe behavior on the spot.
	<ul style="list-style-type: none"> • If in doubt, stop the job, and warns those who may be in danger
<i>Be Mindful</i>	<ul style="list-style-type: none"> • Stay vigilant; maintain continual awareness of hazards, surroundings and adjacent work.
	<ul style="list-style-type: none"> • Anticipate possible risks and problems; constantly asks 'what could go wrong'?
	<ul style="list-style-type: none"> • Take time to plan and organize necessary steps and resources to do the job safely, and keep the workplace tidy.
	<ul style="list-style-type: none"> • Avoid assumptions, verify and check understanding when unsure.
<i>Get Involved</i>	<ul style="list-style-type: none"> • Take care of other team members, and support team HSSE standards.
	<ul style="list-style-type: none"> • Contribute to team HSSE discussions and meetings.
	<ul style="list-style-type: none"> • Participate in local programs or initiatives to improve HSSE performance
	<ul style="list-style-type: none"> • Share own HSSE knowledge and learning with others.

SUPERVISORS

<i>Deliver HSE Excellence</i>	<ul style="list-style-type: none"> • Visit the worksite frequently to ensure compliance, and discusses HSSE issues with team.
	<ul style="list-style-type: none"> • Explains to team that HSSE excellence is expected of them.
	<ul style="list-style-type: none"> • Help team to resolve production/HSSE conflicts.
	<ul style="list-style-type: none"> • Able to challenge others, and accept challenges.
<i>Encourage the Team</i>	<ul style="list-style-type: none"> • Get to know the strengths and limitations of each team member.
	<ul style="list-style-type: none"> • Seek and listen to team HSSE suggestions, concerns and ideas.
	<ul style="list-style-type: none"> • Recognize and reward good individual and team HSSE performance, and deal firmly and fairly with poor performance.
	<ul style="list-style-type: none"> • Promptly act on HSSE concerns, seeking management support where necessary.
<i>Promote Risk Awareness</i>	<ul style="list-style-type: none"> • Take time to plan work with team, challenging any complacency about routine work.
	<ul style="list-style-type: none"> • Use their experience to help team to recognize and manage hazards and risks.
	<ul style="list-style-type: none"> • Encourage the team to be wary, and stop the job if they have HSSE concerns.
	<ul style="list-style-type: none"> • Carefully reassess hazards and risks when changes occur.
	<ul style="list-style-type: none"> • Consider other hazards, e.g. security, health, environment.
<i>Involve the Team</i>	<ul style="list-style-type: none"> • Work with the team to ensure they understand their HSSE goals and responsibilities.
	<ul style="list-style-type: none"> • Regularly initiate team discussions about HSSE performance, and shares lessons learned.
	<ul style="list-style-type: none"> • Support, coach and involve team members in implementing HSSE improvements.

For more information on Human Factors see <http://info.ogp.org.uk/hf/> & <http://www.ogp.org.uk/pubs/368.pdf>

It is increasingly clear that many workplace incidents are triggered by human behavior. Therefore, it is advisable that the HSE Management System be promoted by behavioral based HSE programs. Programs which focus directly and proactively on unsafe behavior or unsafe acts can produce positive results for both the individual and the organization.

Behavioral Based HSE programs develop both **individual responsibility** and **shared vigilance**. Individuals learn to identify unsafe behaviors and apply these learning's to their own work. The identification of unsafe behaviors or unsafe acts can also be applied to a team, a crew or an organization so that through a shared perception of risk & shared experience the working environment is made safer.

A number of effective programs have been developed to help individuals and organizations deal with unsafe behavior. Some of these programs are described briefly below as a starting point in behavioral safety program.

Note: It is very important for management to understand that behavior

3.3 Work Observation Programs

Work Observation Programs rely on focused observation of people working, effective two-way communication and individual goal-setting for better performance. In these programs, line managers are encouraged to engage in positive HSE related interactions with workers.

Through observation and open, non-threatening questions, the observer examines any hazards present, what the outcomes might be, and how to reduce the risk. If unsafe behavior is observed, the observer seeks agreement & commitment from the person being observed to improve their behavior in the future. The observer will also normally try to commit to assisting in the improvement as well so the agreements are not just "one sided". A follow-up in the future is then also often required by the observer to ensure that the commitments were held.

3.4 Employee Led HSE Programs

Employee-led HSE programs aim to improve employee HSE behavior through peer observation, goal setting and feedback. This type of program is owned and managed by a team or crew, with support from local and senior management. The program develops employee ownership and involvement in HSE.

Once the employees establish the program, good and bad behaviors are defined based in part on a review of previous incidents. A checklist is established for clearly specified good and bad behaviors. Participants systematically monitor their colleagues' HSE behavior in a collaborative atmosphere.

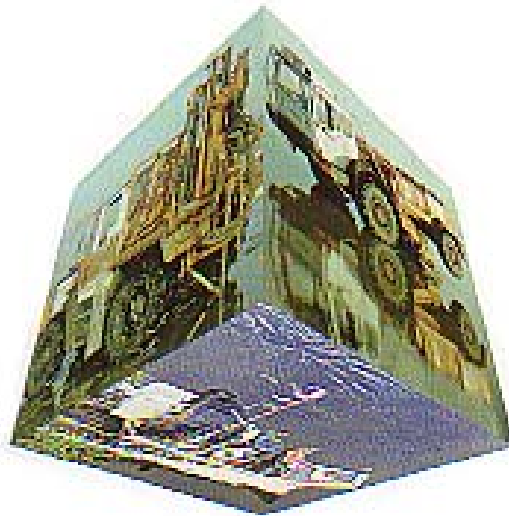
Both of these systems provide team members and line managers with a mechanism to stop any operation if they have HSE concerns. A "time out for safety or stop the job" is called and the team listens to the individual's concerns, discusses the job, and agrees on any actions that are necessary to ensure that the job is completed safely.

Workgroups set their own collective HSE improvement targets. Feedback is provided to the workgroup each week to allow them to track their progress against targets.

Behavioral HSE programs can lead to improved HSE performance; a better acceptance of responsibility for HSE and a better understanding of the relationship between behavior and incidents.

Note, however, that each of these programs requires thorough preparation and advance training.

4. HEALTH, HYGIENE & INJURY PREVENTION



4 HEALTH, HYGIENE AND INJURY PREVENTION

Employees need to be physically fit and healthy. A medical check may be required at pre-employment and on a scheduled basis. Personnel should advise their Master and /or Medic of:

- conditions that may prevent them from completing the job in a safe manner.
- any medication which are prescribed by their own doctor.
- any other self medication.

Prevailing conditions may require employees to participate in a supervised program of medication and inoculations against disease (i.e. anti malarial prophylactics). Full participation is important to maintain health and fitness.

Good health depends on a balance of work, rest, sensible and regular meals, adequate sleep and an avoidance of substance abuse.

On board ship, simple infections can easily be spread from one person to others. Preventive measures, as well as easily effective treatment, are essential.

4.1 Health Risk Assessment (HRA)

It is important that assessments are made of potential factors that could adversely affect the health and welfare of the crew. The factors outlined below represent some of the more significant factors that should be considered in a Company health risk assessment.

Below are described some symptoms, which if you experience any of them, you should seek onboard medical advice.

4.2 Heat conditions

Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. However, even the type of clothing worn should be considered. Prior heat stress predisposes an individual to additional stress.

It is difficult to predict just who will be affected and when, because individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature. Radiant heat, air movement, conduction and relative humidity all affect an individual's response to heat.

Workers should not be permitted to work when their deep body temperature exceeds 38°C (100.4°F).

4.2.1 Heat Rashes

Heat rashes are the most common problem in hot work environments. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

4.2.2 Heat Cramps

Heat cramps are usually caused by performing hard physical work in a hot environment. These cramps have been attributed to an electrolyte imbalance, in the body, caused by sweating. It is important to understand that cramps can be caused by either too much or too little salt.

4.2.3 Heat Fatigue

The signs and symptoms of heat fatigue include impaired performance of work requiring physical and mental co-ordination and vigilance. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

4.2.4 Heat Collapse (“Fainting”)

In heat collapse, the brain does not receive enough oxygen because blood collects in the extremities and blood circulation is restricted. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion but does not affect the body’s heat balance. However, the onset of heat collapse is rapid and unpredictable. To prevent heat collapse, the individual should gradually become acclimatized to the hot environment.

4.2.5 Heat Exhaustion

The signs and symptoms of heat exhaustion are cool, moist, pale, or flushed skin, headache, nausea, vertigo, weakness, thirst and giddiness. Fortunately, this condition responds readily to prompt treatment.

4.2.6 Heat Stroke

Heat stroke occurs when the body’s system of temperature regulation fails and body temperature rises to critical levels. This condition is caused by a combination of highly variable, factors and its occurrence is difficult to predict. The signals of heat stroke include red, hot, dry skin; changes in consciousness; rapid, weak pulse; rapid, shallow breathing.

Heat stroke if untreated can result in death.

4.2.7 Treatment of Heat Stress

When you recognize heat-related illness in its early stages, you can usually reverse it. Get the victim out of the heat and into air conditioned environment. Loosen any tight clothing. Apply cool, wet cloths, such as towels or sheets.

If the victim is conscious, give cool water to drink as described under Fluid Replacement. Refusing water, vomiting and changes in consciousness mean that the victim’s condition is getting worse. Initiate the crew’s Emergency Response Plan (ERP) immediately.

If the victim vomits, stop giving fluids and position the victim on his/her side. Watch for signals of breathing problems. Keep the victim lying down and continue to cool the body any way you can. If you have ice packs or cold packs, place them on each of the victim’s wrists and ankles, on the groin, in each armpit and on the neck to cool the large blood vessels. Do not apply rubbing (isopropyl) alcohol.

4.2.8 Prevention Measures

Ventilation, air cooling, fans, shielding and insulation are the five major types of engineering controls used to reduce heat stress in hot work environments.

- 1) Reduce the physical demands of the work
- 2) Use only individuals who are acclimatized to the conditions.
- 3) Monitor and restrict work hours as necessary
- 4) Provide recovery areas, e.g., a shaded, cooler area. In some circumstances it may be possible to provide air-conditioned enclosures and rooms.
- 5) Use intermittent rest periods with frequent water breaks.

4.2.9 Fluid Replacement

Cool, 50-60°F (10-16°C), water or any cool liquid (except alcoholic drinks) should be made available to workers to encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of fluids should be placed close to the work area. Although some commercial replacement drinks contain salt, this is not necessary for acclimatized individuals because most people add enough salt to their summer diets.

Commercial “thirst” drinks may satisfy your thirst before your body is properly rehydrated.






Urine Color Chart	Dehydration Level	Interpretation
	Level 1	Clear urine means that you are hydrated. You need to continue drinking water as normal.
	Level 2	This means you are fine and maybe you need to drink a little more water.
	Level 3	This is a mild dehydration symptom. You need to drink ½ a bottle of water or about ¼ liters of water in an hour especially if you are outside or sweating.
	Level 4	This is a severe dehydration symptom . You need to drink about ½ liter bottle of water immediately.
	Level 5	This is the most severe sign of dehydration . You should be drinking ½ liter water and seek medical help without delay.

Table 1 - Urine Color Chart for Hydration

4.3 Cold Conditions

One of the most important lessons to be learned is that, in all cases, extreme cold dictates that additional time is required to complete a job assignment. Such additional time should always be allowed in the planning phase.

Climatic conditions in arctic or cold regions are important and must not be ignored. The most persistent and most dangerous is that of extremely low temperatures or low wind-chill.

The adverse effect of cold on man is to produce a condition called hypothermia, which is the lowering of body temperature due to loss of heat at a rate faster than the body can produce it. Normally, body

temperature is 37°C (98.6°F). When the body temperature falls below 34°C, (93°F), the patient may become disoriented and lapse into a coma. Heart failure and death can result if body temperature falls below 31 to 32°C (88 to 90°F).

Frostbite (a cold injury caused by freezing of the body tissues or body part) can occur without hypothermia when extremities do not receive sufficient heat from the central body due to restricted blood circulation or inadequate insulation. Both conditions (frostbite and hypothermia) may occur at the same time if the body is exposed to subfreezing temperatures. Whenever a patient is treated to thaw any portion of the body, care must be exercised to prevent the possibility of refreezing.

Hypothermia can occur from exposure to temperatures above freezing in instances such as immersion in cold water, exposure to wind (wind chill), physical exhaustion and insufficient food.

Drinking alcohol in a cold environment is extremely dangerous. It causes dilation of the blood vessels, permitting a rapid loss of body heat and thus, increasing the risk of hypothermia.

Related cold injuries include trench foot (a thermal injury resulting from exposure to cold, short of freezing, in a damp or wet environment), immersion foot (an injury resembling trench foot and caused by prolonged immersion of the extremities in water) and the effect of total immersion in near freezing water. In this last case, immersion for only a few minutes will cause total body cooling with a marked drop in inner body temperatures. Exposure to severe dry cold while inadequately dressed will produce the same effect.

In general, the length of time that a person may be exposed to cold, without danger of injury, varies directly with the temperature, wind velocity and protective clothing. The lower the temperature and the stronger the wind, the sooner injury will occur.

4.3.1 Wind Chill

The primary problem in cold weather is exposure to lower temperatures ranging from 5 °C (41°F) above zero to 45°C (50°F) below. In calm air, 4°C (39°F) above zero might not seem very cold, but in a relatively gentle 16 km (10 mph) wind, the equivalent chill temperature drops below freezing.

Maximum wind speed occurs during periods of seasonal transition and changing temperatures. Winds above 160 km/hr (100 miles/hr) during such periods have been recorded. For the full impact of wind chill, you can note on the wind-chill chart that a 16 km (10 Mph) wind with a -21°C (-6°F) calm air temperature produces an equivalent chill of -32°C (-25°F), at which exposed flesh may freeze within one minute.



NWS Windchill Chart

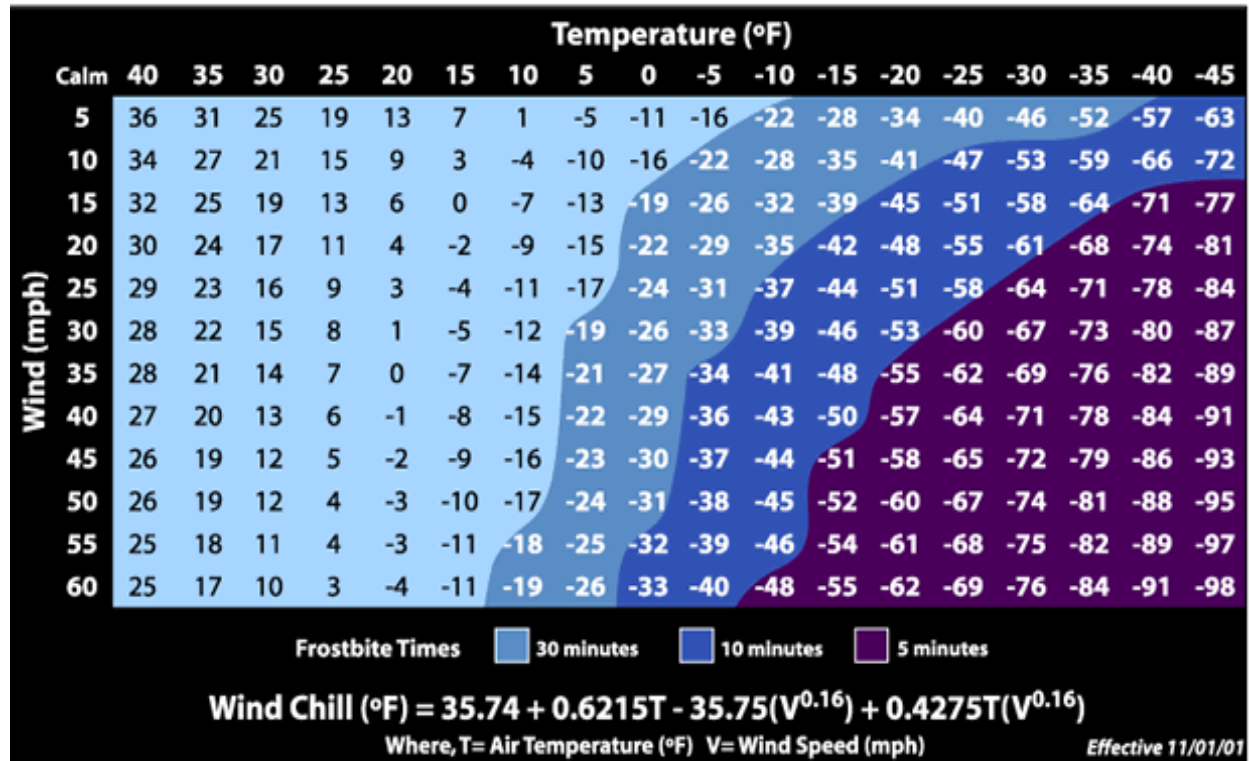


Figure 4 – US NWS Wind Chill Chart (Imperial)

Metric Wind Chill Chart														
		Temperature (degrees Celsius)												
		10 °C	5 °C	0 °C	-5 °C	-10 °C	-15 °C	-20 °C	-25 °C	-30 °C	-35 °C	-40 °C	-45 °C	-50 °C
Wind speed (kph)	10 km/h	8.6	2.7	-3.3	-9.3	-15.3	-21.1	-27.2	-33.2	-39.2	-45.1	-51.1	-57.1	-63.0
	15 km/h	7.9	1.7	-4.4	-10.6	-16.7	-22.9	-29.1	-35.2	-41.4	-47.6	-53.7	-59.9	-66.1
	20 km/h	7.4	1.1	-5.2	-11.6	-17.9	-24.2	-30.5	-36.8	-43.1	-49.4	-55.7	-62.0	-68.3
	25 km/h	6.9	0.5	-5.9	-12.3	-18.8	-25.2	-31.6	-38.0	-44.5	-50.9	-57.3	-63.7	-70.2
	30 km/h	6.6	0.1	-6.5	-13.0	-19.5	-26.0	-32.6	-39.1	-45.6	-52.1	-58.7	-65.2	-71.7
	35 km/h	6.3	-0.4	-7.0	-13.6	-20.2	-26.8	-33.4	-40.0	-46.6	-53.2	-59.8	-66.4	-73.1
	40 km/h	6.0	-0.7	-7.4	-14.1	-20.8	-27.4	-34.1	-40.8	-47.5	-54.2	-60.9	-67.6	-74.2
	45 km/h	5.7	-1.0	-7.8	-14.5	-21.3	-28.0	-34.8	-41.5	-48.3	-55.1	-61.8	-68.6	-75.3
	50 km/h	5.5	-1.3	-8.1	-15.0	-21.8	-28.6	-35.4	-42.2	-49.0	-55.8	-62.7	-69.5	-76.3
	55 km/h	5.3	-1.6	-8.5	-15.3	-22.2	-29.1	-36.0	-42.8	-49.7	-56.6	-63.4	-70.3	-77.2
	60 km/h	5.1	-1.8	-8.8	-15.7	-22.6	-29.5	-36.5	-43.4	-50.3	-57.2	-64.2	-71.1	-78.0

Figure 5 - Metric Wind Chill Chart

4.3.2 Personal Protection

A person can be protected from cold by the following means:

- 1) The correct use of specialized cold weather clothing.
- 2) The regular and frequent consumption of essential foods and liquids.
- 3) Auxiliary body heating and cooling devices should be included for prevention and first aid.

The principles governing clothing are:

1. Use only clothing designed for arctic or extreme cold conditions. Several layers, instead of very thick garments, are preferable.
2. Dress consistent with the weather. Remember: it is easier to remove excess clothing than not have sufficient clothing.
3. Suitable clothing should be available for all weather conditions likely to be encountered.
4. The efficient use of clothing requires observation of the following:
 - a) Clean clothing
 - b) Overheating, avoid sweating
 - c) Loose clothing and in layers.
 - d) Dry clothing

Remember **C-O-L-D** to keep warm in winter.

- 1) Clean clothes not only provide for good body hygiene and comfort but, more importantly, they provide efficient insulation.
- 2) When the temperature rises:
 - a) If indoors, wear a minimum of clothing and don't overheat the shelter.
 - b) If outdoors or when hard work is being performed, adjust clothing accordingly
 - c) It is better to be a little cold than too warm in order to promote maximum effectiveness of body heat production.
- 3) During severe wind-chill conditions, wear a cold-weather mask or wool scarf. Remove face protectors at intervals in order to check for frostbite.
- 4) **C-O-L-D** applies to hand and footwear, just as it does to clothes.
- 5) Insulated footwear with wool, not cotton, socks are preferred to prevent frostbite.
- 6) Never touch cold metal with bare hands.

4.3.3 Foods and Liquids

Balanced meals and adequate liquid intake are essential to body heat production and the prevention of dehydration.

- 1) Eat a nutritional, balanced diet for essential body heat production.
- 2) Eat regular balanced meals as instructed, particularly in the morning and evening before and after a hard day's work. A carbohydrate diet is preferable to a high protein, high sugar, or high fat diet.
- 3) Maintain normal liquid intake.
 - a) Dehydration (loss or deprivation of water) is as prevalent in cold regions as it is in hot-dry areas.
 - b) Dehydration should be avoided at all costs by consuming sufficient additional liquids to offset losses caused by additional exertion in order to perform all tasks in cold weather.
 - c) Warm liquids (hot soup or tea) are preferable since they do not have to be warmed by the body after consumption.
 - d) Eat cold food only as a matter of necessity. Avoid eating snow if at all possible. It will deplete body heat.

4.3.4 Frostbite

Frostbite is characterized by:

- 1) Sensation of coldness followed by numbness.
- 2) Tingling, stinging, aching, or a cramping pain.
- 3) Initial redness followed by pale gray or waxy skin appearance.

To review preventative measures:

- 1) Wear sufficient clothing, including face, ear, eye, head, nose, hand, and foot protection.
- 2) Avoid tight clothing and tight hand and footwear that could interfere with blood circulation.
- 3) Exercise face, fingers and toes regularly. Massage the ears to keep them warm and to detect any numb or hard areas.
- 4) Use the buddy system to detect signs of frostbite.

Frostbite may be either superficial (involving only the skin) or deep (extending below the skin). If any frost bite is suspected, seek onboard medical attention promptly.

Frostbite

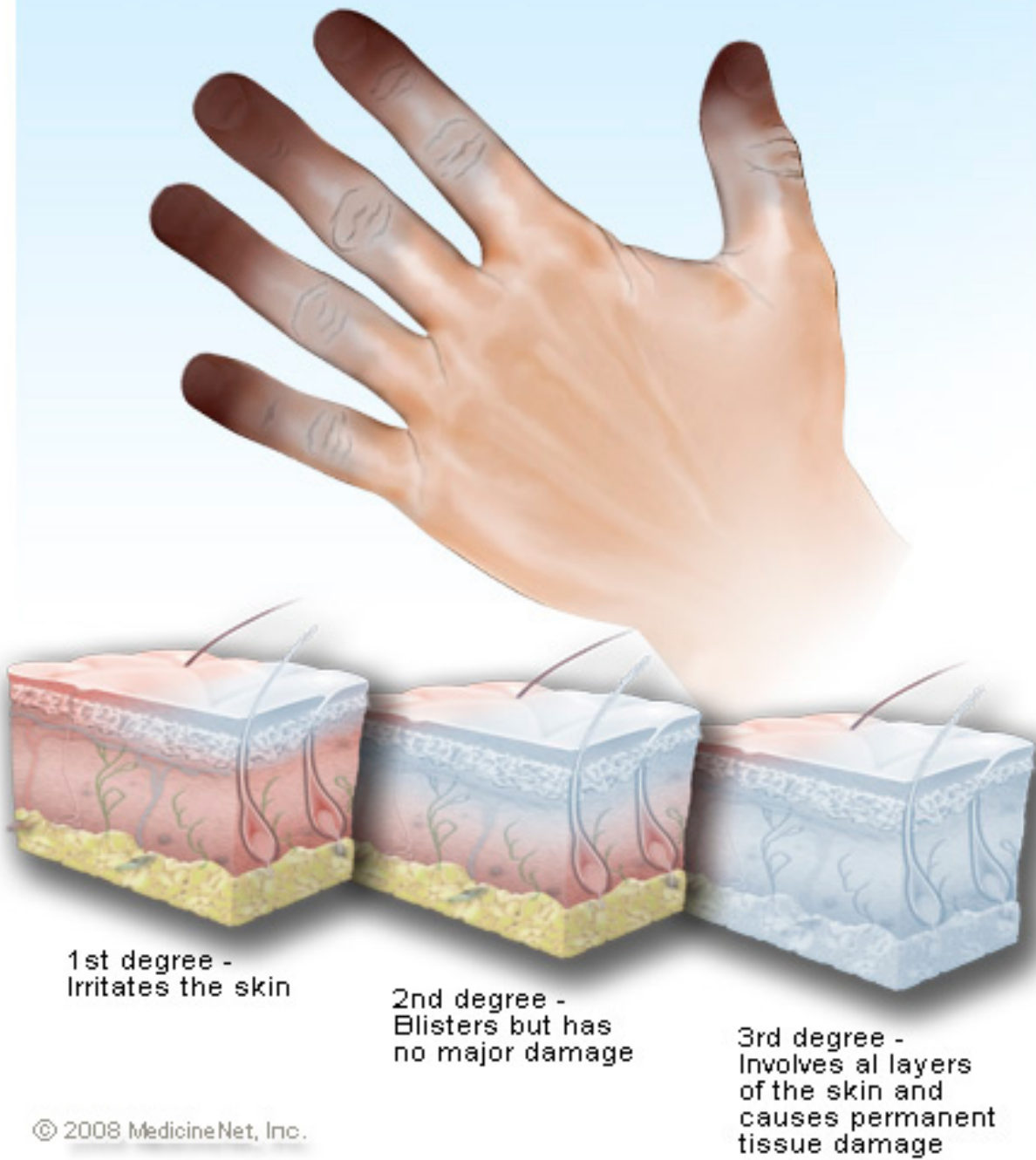


Figure 6 - Degrees of Frost Bite

4.3.5 Trench Foot

Is an injury resulting from exposure to cold, short of freezing, in a damp or wet environment. It is said to occur in the temperature range between zero and 10°C (32 and 50°F). It is almost identical to gradual frostbite since the primary causes are the same except for differences in the degree of cold.

Causes include:

- 1) Immobility of the limbs (legs and feet down as in sitting or standing).
- 2) Insufficient clothing.
- 3) Lack of blood circulation to the body by boots, socks and other garments being too tight.

To prevent:

- 1) Keep feet dry by wearing waterproof footwear including wool socks. Exercise the feet to keep them warm.
- 2) Change into clean, dry socks and boots at every opportunity, or at least daily.
- 3) Dry the feet as soon as possible after getting them wet. They may be warmed with the hands. Foot powder should be applied and dry socks put on.
- 4) If wearing wet boots and socks is unavoidable, the feet should be exercised continually by wiggling the toes and bending the ankles.
- 5) Never wear tight boots.

Treatment:

- 1) Feet should be handled gently. They should not be rubbed or massaged.
- 2) Clean feet carefully with plain white soap and water, dry, elevate and expose to the air.
- 3) While it is desirable to warm the patient, the feet should be kept at room temperature 20°C (70°F).
- 4) After first aid, treatment by qualified medical personnel is essential. The patient should be carried and not permitted to walk on injured feet.

4.4 Personal Hygiene

- 1) Bathe as frequently as conditions permit, daily is normal.
- 2) Keep hair cut and beard shaved or clipped close. Long hair or a beard add very little insulation value and natural hair oils soil clothing. In the open, a beard serves as a base for ice build-up and will mask the appearance of frostbite.
- 3) Since shaving with a blade and soap removes protective face oils, it should be done several hours before exposure to cold in order to allow for replacement of natural oils that reduce the danger of frostbite. Shave at night after work rather than in the morning.
- 4) Electric razors are preferable since they do not remove protective oils.
- 5) Brush your teeth daily.

4.5 Noise



It is well known that exposure to loud noise can cause temporary or permanent hearing damage. This damage can involve loss of hearing ability and people may also suffer a permanent sensation of noises or ringing in the ears, known as 'tinnitus'. Hearing loss caused by exposure to noise at work continues to be a significant occupational injury. Factors that contribute to hearing damage are:

- noise levels [given in decibel units dB(A)]
- how long people are exposed to the noise, daily and over a number of years

Typical high noise areas on a marine crew include:

- airguns being fired on deck
- engine room & machinery spaces,
- compressor room,

All persons exposed to high levels of noise should wear hearing protection suitable for the particular circumstances. A noise survey should be conducted of any questionable area, and controls put in place for areas which exceed 85dB, or lower if required by local legislation

Noise risk analysis should be conducted at defined regular intervals in all areas of the vessel. High noise areas should be clearly identified. The table below show examples of what exposure limits are permitted.

Noise Exposure Limits = 85 dB(A)		
3 dB(A) Exchange Rate	Maximum Permitted Daily Duration (hours)	5 dB(A) Exchange Rate
Allowable Level dB(A)		Allowable Level dB(A)
85	8	85
88	4	90
91	2	95
94	1	100
97	0.5	105
100	0.25	110

4.6 Compressed Air

Air tools; even low pressure tools can blow dirt and other foreign bodies in to the skin. Air guns; high pressure air can tear the skin and flesh, and inflict serious injury. *(see section 3.1 of this manual for additional information.)*

4.7 Electrical

Electrical power can present physical hazards to personnel onboard the vessel. Care is required around all high voltage systems (e.g. Powered streamer cables,

4.8 Chemical

Prolonged exposure to oils may cause dermatitis and other skin conditions. Avoid contact as much as is possible and wear appropriate long sleeved and full leg clothing as secondary protection. All traces of oil should be thoroughly washed from the skin and hydrocarbon solvents should be avoided. Contaminated work clothes should be changed immediately & laundered frequently. Oil-soaked rags should not be placed in pockets.

Exposure to or contact with toxic chemicals or other harmful substances should be reported immediately and the appropriate remedial action taken.

Some domestic substances, such as caustic soda and bleaching powders or liquids, can burn the skin. They may react dangerously with other substances and should not be mixed indiscriminately. Always consult the Material Safety Data Sheet (MSDS) before using any such substance.

Your vessel should have a register of all hazardous materials that are on board and supporting MSDS.

Eye injuries can be caused from either physical or chemical factors such as

- a) Infrared rays (e.g. gas welding)
- b) Ultraviolet rays (e.g. electric welding)
- c) Exposure to chemicals (e.g. battery acid)
- d) Exposure to particles and foreign bodies (e.g., from helicopters, wind, grinding and cutting)
- e) Strong sunlight or snow blindness.

4.9 Biological

Many serious infections can be guarded against by inoculations and vaccination. These treatments should be kept up to date as necessary to meet the requirements of the location or circumstances.

4.9.1 Malaria



Mosquitoes transmit malaria, encephalitis, yellow fever, west Nile virus, chikungunya, elephantiasis and dengue fever. Malaria, especially falciparum malaria, is a serious condition that can result in death within a few days if untreated. A Malaria Management Program should be in place where risks require such plans. Elements of the program should include, but not be limited to:

- Awareness Training for personnel;
- Bite prevention measures (i.e. sprays, netting, long sleeves and trousers);
- Chemoprophylaxis suitable for type of Malaria (e.g. Malarone, Doxycycline, Larium)
- Early diagnosis of symptoms and treatment.

How to Protect Yourself

If you are travelling to an area at risk of malaria, you need to protect yourself before you travel, while travelling, and when you return home.

Before travel

At least one month before you travel, speak with a travel clinic nurse or doctor. Ask about the risk of malaria in the area you plan to visit. If anti-malaria medications are recommended, you will be given a prescription. Most anti-malaria medication should be started at least one week before travelling. Make sure you are aware of the possible side effects of the prescribed anti-malaria medication and that you know how to take the medication correctly and how long to take it.

Note: It is NOT recommended for preventive treatment to be administered to indigenous employees as a routine, as it may compromise their natural immunity.

While travelling

You can reduce your chance of malaria infection by doing the following:

Prevent mosquito bites.

- Mosquitoes are most active after sunset and before sunrise. Wear light colored clothing, long sleeve shirts, pants, and socks during these times. Treat clothing with an insect repellent prior to wearing them.

- When you are outside between dusk and dawn, use insect repellent on all exposed skin. The most effective repellents contain the ingredient DEET. *Caution - While "DEET" is the specified repellent for some areas, prolonged exposure may cause illness.*
- Burn pyrethroid mosquito/insect coils in the evening in well-ventilated areas.
- Sleep in places with screened windows and doors, or with air conditioning if possible.
- Sleep under a small-mesh mosquito net that has no holes and has been sprayed with an insecticide. Tuck the mosquito net under the mattress before it gets dark each day, or first thing in the morning, to prevent mosquitoes from getting into your bedding. The mosquito net is important if you cannot stop mosquitoes from entering your room.
- Apply insecticidal spray or fogging in the living & sleeping quarters.
- Use non-perfumed toiletries, antiperspirants & soaps. Mosquitoes are attracted to scented products.

When you return home

Anti-malaria medication does not prevent mosquito bites, or parasites from getting into your body. Once inside your blood, the parasites multiply. The medication stops the parasites from multiplying.

You must continue to take your anti-malaria medication as prescribed by your medical advisor or doctor after leaving the area at risk of malaria and returning home. If the medication is not taken for the recommended length of time, the parasites may start to multiply in your blood and make you sick.

Even when taking anti-malaria medication, there is a small chance of developing the illness, sometimes months later. If you develop a fever within a year of your return home, or other symptoms such as persistent headaches, muscular aches and weakness, vomiting or diarrhea, speak with your doctor and tell him/her about your travels. Most companies will provide employees with a form that can be given to the doctor to aid in this process. Early diagnosis can prevent serious complications.

4.9.2 Sexually Transmitted Diseases (STD)

Sexually transmitted diseases must be considered a major and potentially fatal health problem. Condoms can significantly reduce the risk of contracting sexually transmitted diseases but abstinence is the only guarantee.

4.9.3 Blood Borne Pathogens

HIV and all strains of hepatitis are classified as blood borne pathogens. There may be times when due to an accident or personal injury you may be asked to render first aid to the injured. Universal precautions must be taken to prevent coming into contact with any blood or body fluids. Universal precautions must also be taken when rendering first aid to avoid any contamination.

- 1) All blood samples and body fluids should be handled and treated as if they are infectious.

- 2) If the area is contaminated with blood, provisions for a thorough cleansing of the site must be followed.
- 3) Personal Protective Equipment (PPE) must be worn to protect from contact with blood and body fluids, including latex gloves, fluid shield masks and a disposable apron.

Proper disposal methods for all contaminated materials must be enforced.

4.10 Ergonomic

Computer use and Repetitive strain injury (RSI)

Some Computer users can suffer health problems as a result of their work but this can generally be avoided by good workplace and job design, and by training users. Health risks can include:

- Upper limb disorders (often inaccurately called repetitive strain injury or "RSI"), typically displayed as: Aches and pains in the hands, wrist, arm, neck or shoulder. In severe cases if no action is taken, these disorders can become persistent or even disabling.
- Stress: from pace of work and deadlines, or through frustration or anxiety.
- Eyestrain: Long spells of Computer work can lead to tired eyes, discomfort or headaches (and can make users more aware of eye defects such as short sight). However there is no evidence that Computer work can cause disease or permanent damage to eyes.

Employers and Computer users can take various practical steps including:

- Set up equipment and workstations for the most comfortable working position, making full use of adjustable chairs, etc;
- Make sure there is enough work space to take whatever documents and other equipment are needed, in convenient positions;
- Arrange the screen, desk and lighting to avoid glare or bright reflections on the screen;
- Users should avoid sitting in the same position for long periods. It is best to change posture as often as practicable, and take frequent breaks (either as rest breaks, or changes to a different kind of work).

4.10.1 Lifting

Most back injuries are caused by negligence or violation of basic safe lifting rules. You can prevent a painful back injury if you first assume a squatting position. Keep the object close to your body and raise the object by straightening legs. Get help when needed.

- 1) Be sure your footing is secure.
- 2) Keep your body erect. Always lift with your legs and not your back.

- 3) Assess the weight before lifting. If the object is too heavy, too large, or awkward in shape or size, get help. To avoid the load on one person when lifting with others, pick up or lay down the object on a given signal.
- 4) Take advantage of skids, hoist, bars, cranes, jacks, blocking, rollers or hand trucks when moving heavy material.
- 5) Never pick up or put down an object while in a twisted position.
- 6) Never place yourself under a heavy object when it is being lifted.
- 7) Use the correct lifting procedures for lightweight objects as you would for heavy weight. Failure to do so may result in needless injury.

4.11 Hours of Work

It is well accepted that fatigue will adversely affect your judgment in even simple and familiar activities. To keep going when tired is not a sign of strength but potentially a danger to yourself and others. Sometimes it is difficult to recognize fatigue in yourself and it is important that management practices and systems control activities so as to safeguard against it happening.

The number of hours that a person may work without a break is mandated by law in some countries and for maritime crew designated for watch keeping by STCW-95 convention. Careful consideration should be made of all applicable regulations concerning work hours and rest periods.

Haste, stress and fatigue are often contributing factors to many accidents. In the absence of regulatory requirements, appropriate work and rest schedules should be considered.

4.12 Substance Abuse

The use of alcohol and drugs increases the risk of incidents. Employees must be aware of company, client and contractor policies on drugs and alcohol. Possession and/or use of alcohol and illicit drugs or being under the influence of these can be cause for dismissal.

4.13 Use of Tools

The improper use of hand tools is the major cause of many minor but painful injuries.

- 1) Use a tool only for its designated purpose
- 2) Replace worn parts such as ratchet cogs, dies, handles and shields. Keep chisels, screwdrivers and punches properly dressed. Dispose of defective tools that cannot be repaired. Use eye protection as required.
- 3) Do not use “cheaters” on wrenches that are too short.
- 4) All electric hand tools must be either grounded or double insulated. Three-wire cords must be used with grounded tools.

- 5) Ground Fault Current Interrupters (GFCIs) or Residual Current Circuit Breakers (RCCBs) shall be utilized for tools operated in wet areas. These circuit breakers should be periodically and systematically tested.
- 6) Additionally, in wet areas, battery or air-operated tools are preferred, or consideration should be given for use of 110-volt tools operated through an isolating transformer.
- 7) Some tools are designed with protective guards. If the guard has been removed or does not work properly, do not use the tool until the guard has been repaired or replaced.
- 8) Any modifications to hand tools should be avoided and if needed they must be done by qualified personnel.

4.14 Working at Heights

A Permit to Work (PTW) should be obtained for unguarded heights over two meters, or as recognized by a risk assessment.

Nobody should work at heights if they have a fear of heights or feel unwell.

A safety line or harness should be worn, and attached to properly designed rings or wires.

4.15 Personal Protective Equipment (PPE)

4.15.1 General

Appropriate clothing for the task and work area must be worn.



Work clothes should be close fitting with no loose flaps, bulging pockets. Injuries may result from clothing being caught up by moving parts of machinery, obstructions or projections. Clothing worn in galleys, etc, where there is a risk of burning or scalding should adequately cover the body to minimize the risk and be a material of low flammability.

Shirts or coveralls provide better protection if they have long sleeves.

Scarves, sweat rags and other neckwear, loose clothing, necklaces, bracelets, rings, earrings and other body piercings are hazardous when working with machinery and should not be worn. Long hair should be covered.

Gloves should be worn for specified jobs.

Hard hats and protective footwear must be worn as required by company policy, crew procedures and by posted instructions.

When selecting eye and combined eye and face protectors, careful consideration should be given to the kind and degree of the hazard and the degree of protection and comfort afforded. Ordinary prescription glasses do not afford protection. Eye protection is available in a wide variety of styles and applications. Prescription eye protection is also available. Eye protection must never hamper your vision. If it does then stop work and rectify immediately.

4.15.2 Personal Floatation Devices (PFDs)

Personal Floatation Devices (PFD) are required to be worn by all personnel, (regardless of whether they can swim), who operating in, over, through or on water, where there is a danger of drowning.

- All personnel must wear a life jacket when in a small boat.
- All personnel must wear a PFD when on open deck in heavy seas.
- Personnel working on the stern must wear a PFD at all times. Personnel positioned near the stern should wear a safety harness and attached life line when working close to slipways and other areas open to the sea.

PFDs must be worn correctly and adjusted securely at all times when in use. Particular attention is drawn to point 3 below. A loose PFD will not operate as designed.

Personal Flotation Devices (PFDs) must have:

1. A buoyancy collar to hold the head out of the water.
2. Buoyancy over the chest to turn the individuals face up in the water.
3. A securing belt around the waist and/or chest to stop the Personal Flotation Device (PFD) from moving up over the individuals head.
4. A hoop or loop at the back of the collar by which the individual can be pulled through and out of the water.

4.15.3 Life Jackets/Work Vests



There is an extensive choice of life-saving equipment available, and the first decision is whether to use a work vest or a life jacket for a particular type of operation.

The main difference is one of degree rather than function. Work vests will, at their best, assist a conscious person to stay afloat in the water. A life jacket is designed to turn an unconscious or exhausted person face upward, with the head held clear of the water.

Points worthy of note during any assessment of personal flotation devices (PFDs) or work vests are as follows:

- 1) Equipment should be approved by a recognized independent body.
- 2) In order to maintain a 60° face-up position, backward from the vertical position, it is necessary to have closed-cell foam padding all the way down the front and half way or less down the back.

Consideration should also be given to wear and tear that causes foam to shift about, affecting the distribution of buoyancy.

- 3) If zippers are used on the devices, they should be of good quality, preferably with tie straps at the top and bottom.
- 4) A belt or strap should be provided to assist in retrieving the victim from the water.
- 5) Consideration should be given to comfort and vision. Those devices without crotch straps can result in the victim dropping down inside the device until the shoulder seams are on a level with the top of the head. A flotation collar that gives additional head support is also preferable.
- 6) A whistle should be provided on the Type I PFD that is housed in a loop or small pocket as well as a light that is activated on immersion in water. The color must be orange or yellow for good visibility and reflective strips on the shoulders or collar are an added advantage.

The three main types of life jackets are:

- 1) An inherently buoyant life jacket, well-padded with closed-cell foam.
- 2) Manual gas-inflatable life jackets with a pull-tag to activate the carbon-dioxide cylinder with oral inflation tube.
- 3) Automatic gas inflatable life jackets in which the carbon-dioxide cylinder is activated when immersed in water, with both oral inflation and manual pull-tag override.

Cold water can be your worst enemy because sudden immersion induces short, gasping breaths and panic. A novice will flounder, finding it difficult to grab at a pull-tag or inflate a jacket orally. This is another argument in favor of inherent buoyancy or automatic gas inflation.

Even if a life jacket is doing its job, in shallow sea conditions, near sea walls, the sides of boats, or in estuaries, waves breaking over the head may cause drowning. Splashguards are not a standard item but a number of manufacturers can supply them and they should be considered.

Life jackets should be capable of being donned and adjusted within 30 seconds. They should have a conspicuous, centrally positioned lifting bracket (a strong webbed loop with which to pull the wearer from the water). They should turn an exhausted or unconscious person face upward (within five seconds with inherent buoyancy and ten seconds with auto or manual gas inflation) and hold the body inclined backward between 30° and 60° from the vertical with the mouth clear of the water. The life jackets should be either yellow or orange for good visibility.

4.15.4 Inflatable Life Jackets

Manual and automatic gas inflatable Type I life jackets can be worn flat and folded against the body but neither becomes a life jacket until inflated. If you fall into the water unconscious, a jacket requiring manual inflation will be of little use. Under no circumstances should an automatically inflatable or inherently buoyant life jacket be worn while in a helicopter since, in the event of ditching, it will inflate and trap the wearer inside the emergency exits.

Manual and automatic gas inflation models need more servicing than a jacket with inherent buoyancy. The cylinders should be weighed at regular intervals to ensure the carbon dioxide has not leaked.

According to manufacturers' instructions, company procedures and local regulating agencies, a thorough inspection program should be devised. Inflatable life vests should not be worn by non-swimmers.

Dual chamber / dual cartridge vests are preferred over single chambered vests as they will provide added protection in the event that one of the chambers on the vest is punctured.

4.15.5 EN PFD Classifications

50N Buoyancy Aids – EN393 (11lbs / 5.5kg of buoyancy)



These products are designed for competent swimmers, and are suitable for use in sheltered waters. They will only provide support to a conscious person who can normally help themselves.

100 Newton Lifejacket – EN395 (23lbs / 11kg of buoyancy)



These lifejackets are designed for both swimmers and non-swimmers and are suitable for use around inshore and coastal waters. They give a reasonable assurance of safety from drowning in relatively calm waters.

These products are NOT guaranteed to self-right an unconscious person wearing waterproof clothing and should not be expected to protect the airway of an unconscious person in rough water.

Under EU regulations, these lifejackets must be constructed out of a bright colored fabric with 100cm² of SOLAS reflective tape stitched to the front and provided with a whistle for attracting attention.

They are most commonly used on inland waterways and lakes or on the coast by craft operating reasonably close to shore in fair weather and fair sea conditions.

These jackets are often constructed in a foam waistcoat-style, making them simple to fit and relatively maintenance-free.

150N Lifejacket – EN396 (33lbs / 16kg of buoyancy)



These lifejackets are suitable for both swimmers and non-swimmers, and are designed for use in inshore as well as offshore and in all but the most severe conditions.

They give reasonable assurance of safety from drowning, to a person not fully capable of helping themselves (i.e. someone unconscious).

However they may not immediately self-right an unconscious person wearing heavy waterproof clothing that might trap air that could counter-act the normal righting moment of the lifejacket's buoyancy.

These lifejackets can be constructed out of foam (looking very similar to the orange foam lifejackets seen on ferries), or they can be of a low profile gas inflation design.

Under EU regulations, these jackets must be constructed out of a bright colored fabric (when inflated) with 300cm² of SOLAS reflective tape stuck to the front and provided with a whistle for attracting attention.

The EN396 150N gas inflation model lifejacket is the most popular type sold in the UK, particularly for leisure craft such as yachts and motor cruisers where their lower profile design is valued for being unobtrusive and easy to wear.

They can be supplied in both manual activation (inflated by pulling a toggle) and automatic water-activated models which inflate when they are submersed in water.

275 Newton Lifejacket- EN399 (62lbs / 28kg of buoyancy)



These lifejackets are suitable for both swimmers and non-swimmers and are designed to provide a high performance device for offshore and severe conditions, when maximum protection is required or where heavy waterproof clothing is worn that can trap air.

These products give improved assurance of safety from drowning, to people who are not able to help themselves (i.e. unconscious).

While they cannot be guaranteed to immediately self-right an unconscious person wearing heavy waterproofs that might trap air, the buoyancy that they provide should ensure that they will do so in the majority of cases.

Under EU regulations, these products must be constructed out of a brightly colored fabric (when inflated) with 300cm² of SOLAS reflective tape stuck to the front and provided with a whistle for attracting attention.






The 275N gas inflation model lifejacket is popular on leisure vessels that travel further offshore or on ocean passages in challenging conditions and also by smaller commercial operators that do not need to comply with full SOLAS lifejacket regulations but want the assurance that the improved performance offers.

The low profile design is also valued for being unobtrusive.

These jackets are normally supplied in automatic water-activated models which inflate when they are submersed in water.

Reference: ISO 12402 Lifejacket Standard

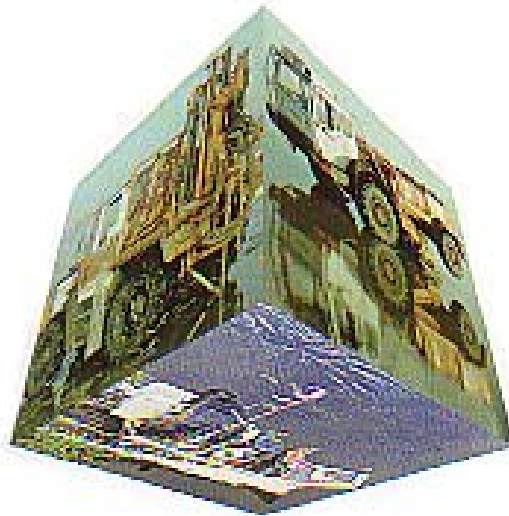
4.15.6 US Coast Guard PFD Classifications

Classification	Use	Advantages	Disadvantages
Type I Offshore life jacket 	Best used for open, rough or remote waters where the possibility of rescue may take some time. Minimum Buoyancy Ratings: 22 lbs.	Floats you the best Turns most unconscious wearers face-up in water	Bulky Not comfortable for extended wear
Type II Near shore buoyancy vest 	Intended for calm inland waters or where there is a good chance of a relatively quick rescue. <i>Examples of these vests would be the basic orange vests most boaters have onboard.</i> Minimum Buoyancy Ratings: 15.5 lbs.	Turn “some” unconscious persons to a face-up position. Less bulky and more comfortable to wear than a Type 1	Will not turn some unconscious wearers face-up Not for long hours in rough water
Type III Flotation Aid 	Ideal for calm, inland water or where there is a good chance for quick rescue. <i>Most common jacket used for recreational purposes.</i> Minimum Buoyancy Ratings: 15.5 lbs.	They are lightweight and comfortable for continuous wear. Come in many sizes and styles.	Will not turn an unconscious wearer to a face-up position. Wearer may have to tilt head back to avoid going face down. Not intended for survival in rough water or the open sea.
Type IV Throwable Device 	Designed to be thrown to a person in the water, grasped and held by the user until rescued. It is intended for calm inland waters with heavy boat traffic, where help is always present. One Type IV throwable device, which should be immediately available, is required on every boat 16 feet or larger. Minimum Buoyancy Ratings: 18 lbs.	Good backup to wearable flotation devices. Can be thrown to anyone in the water needing assistance.	Not for an unconscious person. Not intended for non-swimmers or children. Not intended for survival in rough water or the open sea.
Type V Special Use Device 	Designed and approved for specific activities as listed on its label. <i>Examples include work vests, board sailing vests, and commercial whitewater rafting and kayaking vests.</i> Minimum Buoyancy Ratings: 15.5 -22 lbs.	More convenient or useful for specific activities. Continuous wear prevents being caught without protection. Some Type V devices provide hypothermia protection, such as deck suits. A Type V Hybrid Inflatable PFD is the least bulky.	Less safe than other types if not used according to label instructions. Some Type V's are approved only when worn. If marked this way, they are required to be worn to be counted as a regulation PFD.

4.16 Subcontractors and Visitors

- 1) It is the responsibility of each person, including subcontractors and visitors, to report any unsafe actions or conditions to the local line manager.
- 2) Personnel joining a marine operation should be in good health. Individuals who may be undergoing treatment or taking medication or allergic to particular drugs, should make this known, in confidence, to the local line management.
- 3) Personnel working or visiting offshore should have completed appropriate offshore emergency and survival training courses, as per company procedures.
- 4) All personnel who may visit an offshore operation only occasionally are required to complete a recognized offshore survival course, such as OPITO, OLF etc.
- 5) All safety training records, medical examination dates, medication usage and other pertinent information should be available and presented to the local line manager upon boarding.
- 6) It is mandatory to wear appropriate Personal Protective Equipment (PPE) where required under law, posted or if instructed to do so
- 7) Upon joining a marine operation, visitors should submit emergency phone numbers.
- 8) Upon joining a marine operations, subcontractors and visitors should receive a location specific induction

5. SEISMIC OPERATIONS



5 SEISMIC OPERATIONS

5.1 Air Guns and Compressors

5.1.1 Compressed Air Hazards

Air guns are devices that rapidly release compressed air into the water creating an energy pulse. To provide sufficient energy for geophysical surveys, compressors capable of generating extremely high pressures are required. Seismic sources should not be operated in the vicinity of diving operations.

The typical operating air pressures used in most air gun systems are 70 times greater than those used in a car tire. Any release of air at these pressures is extremely dangerous and can tear the flesh and force dust, air or even oil particles through the skin and into the blood stream.

To minimize risks associated with compressed air, all vessel specific procedures and work instructions should be followed, but at a minimum observe the following:

- All non essential personnel should be clear of the area.
- Never put your hands in front of the jet of air or any pressurized discharge port. Air can penetrate into your blood vessels causing an embolism, which can be fatal. A poster warning of the hazards associated with compressed air should be prominently posted.
- Only qualified persons should operate the air guns, the handling equipment and the air compressors. All other personnel should stay clear of equipment, lines, rigging and booms while deploying, retrieving and working on air gun systems
- All personnel in areas where there is a risk of the sudden release of air should wear ear and eye protection while the system is operating.
- An eye wash station should be located in the airgun area.
- The storage tanks, pipes, lines and fittings used to carry and control this high pressure are specialized equipment and must receive special attention. **Never handle, tighten or loosen bolts or fittings or hammer any part of a high pressure system while pressure is applied.**
- Pressure-relieving valves and other safety devices should never be removed or modified, except for repair or adjustment by qualified personnel and using appropriate procedures including PTW and LOTO
- Any block valves installed upstream or downstream of a relief valve should be locked in the open position.
- When opening valves (excluding ball valves), always close the valve one-half turn after reaching the maximum open position.

- Use of substandard replacement parts is dangerous.
- Ensure that all air hoses are restrained, guarded, and in good condition.
- It is recommended that high-pressure manifolds and all associated assemblies are housed behind a protective screen or cage in a secure space and not in the gun control room
- These procedures should also be applied to ship's service air that normally runs at greater than 100psi (approximately 7 bar).
- In the event of a high pressure air leak on deck, do not attempt to find the location of the leak prior to the pressure being reduced. This should be done by a method which avoids the necessity to go onto the gun deck.



5.1.2 Explosion Hazards

Another danger of compressed air is the possibility of explosion. When high pressure air reacts with combustible fluids in the piping or other system components, explosions can occur. Explosions can also occur when high temperatures are created by sudden compression in the dead end (compression ignition) or when a gauge valve is opened to a vented gauge containing oil. Even a thin film of lubricating or hydraulic oil in the system piping may explode.

Once ignition occurs, propagation of shock wave may cause the pipes to be ruptured at many locations.

To minimize risks:

- 1) Open all valves slowly.
- 2) Keep all compressed air and air piping free of combustible oil and contaminants.
- 3) Never assemble any pneumatic equipment using hydrocarbon oils or grease. Use only vegetable or synthetic oils (as used in compressors) or silicon grease.

- 4) Ensure the compressed air after-cooler is operating to specifications to prevent oil ignition due to high temperature.
- 5) Prevent ignition from other causes, such as electrostatic discharge, compression of oil foam in a pump, external shock and external fire.
- 6) On deck, repairs must be performed with care. Keep open flames and other heat sources away from the air lines and electrical cable. During inclement weather, repairs must be performed under temporary cover. Use the proper hand tools to prevent slippage and injury to repairmen and the burring of hardware, which can cause further injury. (Any burrs on hardware must be filed down or the hardware replaced).
- 7) Pipes and hoses must be secured at frequent and sufficient intervals along their length so that, in the case of fracture, the ends do not whip.
- 8) Never run compressed air lines in electrical cable trays or alongside other critical cables and pipe work.

5.1.3 Air Gun Handling



The air gun is the system component that requires the most handling and maintenance and, consequently, presents the greatest danger to personnel.

When the airguns are being handled, the main switches for disabling/enabling, triggering and pressure control must be controlled and operated from the deck by the crew working on the guns, not from a remote location.



The following must be observed:

- Never put fingers into the gun chamber while the gun is connected to either the air or the electrical firing system. Where possible, the firing system should be part of the lock out tag out procedure.
- If a person is exposed to the risk of falling overboard during the deployment or retrieval of guns, it is recommended that an attached safety harness be worn. A Personal Flotation Device (PFD) MUST be worn.
- When retrieving, deploying or working on air guns, personnel should wear head protection, safety shoes, and eye and ear protection.
- Air gun operation involves high-pressure air hoses, electrical lines and towing cables. Care should be taken to prevent personnel from becoming entangled in or tripping over lines. Handle the high pressure hose and electrical cables carefully to prevent excessive bending, abrasion, or undue strain on the covering.



- Always minimize the pressure in the guns before bringing them on board, and when on board vent them completely.
- A flashing warning light and audible alarm will operate whenever any pressure is applied to the system when the guns are on deck. Such warning equipment should be provided at each entrance to the gun deck accompanied by a sign explaining the purpose of the warning.

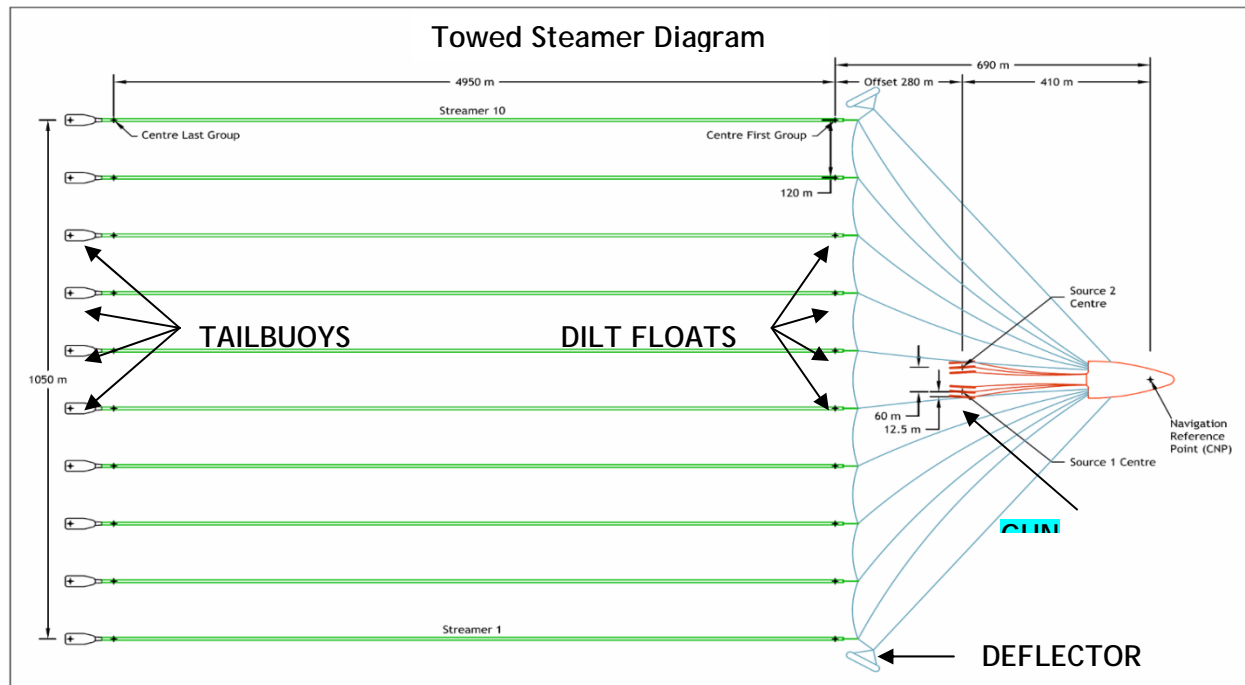


- A lockout tagout procedure should be used to prevent accidental re-pressurization of the system.
- Ensure that all pressure is released before touching or working on a gun.
- Avoid test firing air guns on deck when possible. If such tests must be performed, do not test fire the air gun on deck or in open air until the area has been cleared a safe distance and safety measures implemented. In test firing, air pressure must always be below 500 psi and all persons must be at least 8 m (25 ft.) from the gun. Never handle the gun during testing and always wear protective equipment.

5.1.4 Compressed Air Injuries

In the event of accidental exposure to compressed air no matter how slight, it must be treated as a serious injury. If there is any swelling, pain or unusual discoloration of the area, it must be assumed that the person has been injected and casualty immediately referred for medical treatment.

5.2 Towed Seismic Operations



5.2.1 Deployment and Recovery of In-Sea Equipment

The different types of In-Sea equipment being towed by seismic vessels are continually evolving. The deployment and recovery procedures of in-sea equipment for towed seismic operations should be documented and regularly reviewed.

- 1) Check the operation and condition of all components of the In-Sea equipment system before starting work, e.g., reels, brakes, high and low pressure air, hydraulic power, hoses, paravane system and cables, tail buoys (lights and GPS systems), batteries, radar reflectors, etc.
- 2) All concerned must understand the procedure before deploying or recovering In-Sea equipment. Prior to deploying or retrieving any trailing gear, the ships bridge officers must be informed of the type of equipment to be deployed or retrieved. During deployment and recovery, there must be close cooperation between the marine and geophysical crews.
- 3) A toolbox meeting should be conducted to discuss activities prior deploying gear.
- 4) A check on the expected weather conditions, water depth and vessel traffic should be made before commencing any marine or geophysical operation.

- 5) The operation of communications and video equipment between the back deck and the bridge should be checked. Never begin deployment/retrieval without adequate communications between back deck personnel and the Bridge.
- 6) All In-Sea handling equipment should be operated only by or under close supervision of, a properly trained person.
- 7) All winch and reel operators should have a clear, unobstructed view of all equipment being deployed or recovered. If a clear view is not possible due to design configurations a second person utilizing a proper set of hand signals should be used. (For operations utilizing radio remote systems fully charged spare batteries should be immediately available).
- 8) Winch and reel operators should not multi task while operating controls
- 9) No one should work close to the In-Sea equipment reels while they are turning. Streamer reels should be guarded from gangways and access ways by railings.
- 10) A provision should be made to secure the in-sea equipment reels with a substantial bolt or chain if required
- 11) All handling equipment used to deploy and recover in-sea equipment should be certified for the load plus the expected shock load.
- 12) Before walking or attempting to work under any hanging equipment, the equipment should be properly secured. Additionally, a thorough inspection of all lifting equipment must be done and extra safety lines attached as needed.
- 13) When deploying or recovering in-sea equipment, all persons not involved must keep well clear of the work area in a protected position.
- 14) Personnel should be aware of the potential danger that ropes or wires under tension can pose, when positioning themselves.
- 15) The watch officer must monitor all vessel traffic in the area and warn the back deck personnel of any situation that might involve a course change or other evasive maneuver.
- 16) Safety harnesses and anchor points must be provided on the stern of a vessel. Harnesses and life jackets should be worn as mandated by vessel procedures, or where conditions dictate, or at the direction of the person in charge.
- 17) Correct personal protective equipment should be worn including hard hat, safety glasses, life jacket, coveralls, and safety footwear or any other safety equipment that may be necessary.
- 18) Care should be taken when stopping the cable to attach or maintain depth controllers or similar attachments.
- 19) No one should be allowed between In-Sea equipment and the open stern of the ship during launching activities.

- 20) Edge protective chains or railings should be put back in place once the In-Sea equipment has been deployed or recovered. All tools and equipment utilized during the operation should be stowed properly.
- 21) When cable guiding devices/heads are used, personnel should be aware that they may move due to the stress applied by the seismic cable. They should be properly closed so that the seismic cable cannot come out violently and hit nearby personnel. The cables and ropes should be regularly monitored for excessive tension or stress.
- 22) All in-sea equipment must be securely lashed down when not in use.
- 23) The ships watch officer must be informed that the back deck is clear and that all trailing gear is secured.
- 24) A high voltage hazard exists on some streamer cables. When this type of streamer is being handled, there should be visible indication whether power is on or off.
- 25) All streamer/gun reels, tugger winches, towing blocks etc. should be hydraulically/ electrically isolated when not in use.

5.2.2 In-Sea Repairs and Maintenance

Prior to the commencement of any operations involving in-sea repairs, several points must be considered:

- 1) The operation must be carefully planned and all personnel involved fully briefed during the tool box meeting.
- 2) Clear emergency procedures must be established and understood by all personnel involved in the operation.
- 3) The documented Man Overboard Boat (MOB)/Work boat procedures including launch and recovery instructions should be read, understood and adhered to by personnel participating in the operations. Where possible, the MOB should be in the launch position and not stored on the davit.



- 4) Personnel selected must have sufficient experience and training to safely perform the work. There should be at least two people in the boat in addition to the Coxswain, one of which is experienced in the safe handling and operation of the boat.
- 5) Protective clothing must be worn by personnel and inspected for suitable condition prior to commencing operations. Immersion/work suits for colder latitudes and long sleeved, long trouser clothing and hat should be worn in hotter latitudes. Personal protective equipment should be worn, including Personal Flotation Devices (PFDs), non-slip safety footwear, gloves or any other necessary equipment.
- 6) The weather must be fair and stable, with a good forecast and suited to the planned operation. No operations should commence if it cannot be completed before darkness. The Captain, Party Chief and Coxswain must all agree on the weathers suitability for the launch and operation.
- 7) The Man Overboard Boat (MOB) / Work boat must be fully operational and suitably equipped. For operations where the workboat is to be deployed for longer periods, it should be properly stocked with extra drinking water and sun block.
- 8) Radios (two minimum) to be used during the operation must be checked and be fully serviceable and a working channel agreed upon. A radio check schedule should be established.
- 9) When available, the guard boat should be present and stationed close to the point of operations, and its crew should be aware of their duties, If a guard boat is unavailable then a back up craft should be prepared, checked and ready to go
- 10) All tools and spares should be checked and loaded.
- 11) The workboat must be kept well astern of the guns and as far away from the ships propeller wash as possible. Steering and maneuverability are reduced in the ship's wake. (Although this might not apply with vessels of exceptional beam at the stern.)
- 12) Tying moving in sea equipment directly to the workboat in an un-controlled manner or with equipment not designed for purpose is extremely hazardous because there is a danger of capsizing the boat. Any operation where the Work Boat is connected to the in sea equipment must be risk assessed and strictly controlled. Dedicated and specialized equipment may be used to ensure these operations are effectively controlled – these include dedicated quick releases for stern clamps , bow tow rope
- 13) All small boats should beware of floating ropes that may get sucked in the jets or propellers.
- 14) For vessels deploying wide arrays, extra care should be taken when clearing the paravanes and all associated towing ropes.
- 15) Any non-swimmers should be identified prior to launch

5.2.3 Streamer

Know the general location of the streamer where repairs are needed. After departing the vessel and giving all towed equipment a wide berth, head toward the area of the streamer repair. Keep a general bearing on the mother vessel and locate the tail buoys quickly. If bearings can be kept on both objects, it is easier to keep a safe range on any streamers which will be surfacing prior to repairs. If available, the work boat should be equipped with a RGPS system to allow for efficient location of streamers.

5.2.4 Handling of Paravanes / deflectors

A toolbox meeting should be held before any handling of paravanes/deflectors.



Paravanes as used on modern Multi streamer vessels are capable of generating extremely high forces. Excessive dynamic loading of the wide tow system can occur in some situations due to the combination of sea conditions and vessel movement in extreme weather conditions.



All components should have valid test certificates; load testing should have been carried out in a manner equivalent to the direction of forces that will actually be applied. All components of the system must be operational, and in good condition before any handling operations are undertaken.

Sheaves/blocks used on the system should be of a diameter suitable for the ropes being used. Winches must be sized according to the size and type of paravanes being used.

Systems that do not have energy absorption systems fitted should be treated with extreme caution during periods of heavy weather, or when the paravanes are being handled and/or are close to the vessel.

Vessel specific paravane handling procedures should be reviewed and discussed before any operations begin. Only properly trained and experienced personnel should handle the paravanes and all associated deployment and retrieval gear. Only the crew required for handling process should be involved, and in the locality. Proper PPE shall be worn at all times. The person controlling the winches must be located

in a position where he can clearly see the paravane, and critical components of the system. If a radio remote is being used, then a spare battery should be carried. In the event of a Radio remote failure then the manual control should be established immediately.

Communication between Bridge and operator must be kept open during deployment/recovery of paravanes as the forces generated by the process can have a significant and immediate effect on vessel heading.

Paravanes should not be handled (launch or recovery) if weather forecast is unsuitable, it is normally the responsibility of the Party Chief in coordination with the Gun Chief and with consent from the Master, to decide when conditions are suitable to launch.

Bridge should maintain the correct speed for handling, and hold a steady pre-agreed course.

Launch the paravane and deploy sufficient distance to allow it to achieve lift, do not deploy so much that in event of a stall the vane can go under the vessel, or create other problems.

When the paravane is flying continue deployment, while maintaining a good watch on the behavior and attitude of the paravane.

High strength synthetic tow ropes are commonly used on modern 3D vessels, these ropes have a low melting point, strength of rope typically becomes 5% of MBL at approx 60 centigrade, therefore extra precautions need to be taken to avoid overheating. Overheating can happen around sheaves if the rope is subject to fluctuating load. There are many other reasons for tow ropes to part, and all crew who work around the system should be aware of the consequences of a parting tow rope, and avoid putting themselves into areas that could be considered dangerous.

Splicing of ropes should only be carried out by trained personnel.

If standing tow ropes are used, then extra precautions should be taken in the event of a failure of the standing tow.

- 1) Never work on the slack part of the main tow rope
- 2) Ensure the connection points are properly maintained, and no abrasion is occurring.

In the event of paravanes not being recovered in sufficient time to avoid extreme weather, then this should be considered an emergency situation.

Extra precautions should be taken, and these would include the following

- 1) Ensure turn circles are at maximum possible for locality
- 2) Minimize vessel speed
- 3) If It is considered unsafe to attempt to recover, then deploy to full extents, this is to give additional damping to minimize dynamic forces

- 4) Keep a good watch on the system
- 5) Keep well clear of all components.

After periods of extreme weather the paravane should be recovered at the first opportunity to carry out visual checks.

In the event of problems occurring with paravanes, then careful planning is required to ensure the situation is dealt with safely and efficiently.

5.2.5 Work On Tailbuoys

Do not board or attempt to board a tailbuoy that is not designed for that purpose.

Some tail buoys used in the geophysical industry offer a stable and secure working platform. They are designed similar to a small dinghy style vessel for ease of boarding for maintenance at sea. However, as with any small boat, they can be subject to rapid and possible violent movement at times. This should always be a prime consideration.

Transferring from the boat to the tailbuoy is better accomplished in calm water. The boat is maneuvered alongside the buoy then pushed slightly up against the side of the buoy. The frame or mast stays on the top of the buoy can then be securely gripped and the buoy mounted in a single step (no stride/jump should be required). Reversal of the procedure is accomplished by pushing the boat against the buoy, the handle on the side of the cockpit gripped and the boat mounted in a single step.

5.3 Hazardous Materials (HAZMAT)

Vessels carry products known as Hazardous Material, or HAZMAT, ranging from cable oils to paints and solvents, and cleaning agents. Each Hazardous Material (HAZMAT) product is generally safe to use if the manufacturer's instructions are carefully followed. Mixing or combining products or chemicals can often result in dangerous situations which may cause harmful vapors, explosion or serious eye and skin injuries.

All onboard Hazardous Material (HAZMAT) products should be recorded on a 'Hazardous Materials' inventory supported by Material Safety Data Sheets (MSDS). MSDS lists critical information on a specific product or chemical, such as composition, explosion/flammability rates, safe handling procedures, spill/clean-up information, appropriate Personal Protective Equipment (PPE) required and first aid measures.

Material Safety Data Sheets (MSDS) should be posted near the chemical storage area and at any point of regular use. They should be fully reviewed prior to using the product. A complete inventory must be maintained and archived at an accessible public location (e.g. the crew lounge, Administrator or Party Chief's office) as a 'Right To Know Station'.

5.3.1 Cable Oils

Cable oil is highly flammable.

- 1) Clearly mark deck tanks or containers of cable oil "Flammable".

- 2) Smoking, welding or open flames are not allowed at or near the cable reel or cable work areas.
- 3) Clean the deck thoroughly after each deployment/retrieval of cables or any cable work.
- 4) **DO NOT WASH OILS OVERBOARD.**
- 5) Wash skin or clothing that comes in contact with cable oil immediately with large amounts of water as cable oil evaporates rapidly and can cause serious burns.

5.3.2 Batteries

Batteries on board marine vessels can be extremely hazardous if not cared for properly. Different types of batteries require different procedures for handling, charging, connecting and disposal

5.3.2.1 Lithium batteries

The following should be conducted to ensure lithium battery risks are minimized:

- Regular inspection & routine maintenance must be set up and followed to ensure in sea units are not corroded to allow water ingress. Water tight integrity checks should be conducted.
- O-rings should be changed every time batteries are replaced on in sea units.
- Replace stainless steel bodies to plastic/polycarbonate or equivalent that are corrosion resistant.
- Battery storage areas, boxes and charging spaces must be well ventilated and kept free of flammable products, explosive gases, open flames, electrical spark hazards, metal objects and portable power tools or lamps.
- Battery storage areas should not be used as storerooms for any material or products and no unauthorized modifications or additions should be made to any compartment electrical equipment or fixtures in the storage area.
- Appropriate Personal Protective Equipment (PPE) should be worn at all times when handling or transporting batteries (rubber gloves, rubber apron, face shield or goggles). An eye wash station should be located near the battery compartment for immediate use in case of an accident.
- Jewellery, watches, rings, etc., should be removed when working on batteries. A short circuit through any of these items will heat the metal object rapidly and cause severe burns. If rings cannot be removed, they should be taped with insulating material.
- All battery connections should be kept clean and tight to avoid sparking and overheating. Insulation and/or guarding of all battery cables should be maintained in good condition. Never short-circuit a battery.
- All circuits fed by the battery should be switched off when the leads are being connected or disconnected. If a battery is in sections, it may be possible to reduce the voltage between cells in the work area and, hence, the severity of an accidental short circuit or electric shock by removing the jumper leads between sections before the work is begun.

- Battery cell vent plugs or caps should be tightly secured, except during charging when they should be loose. The ventilation tubes of battery boxes should be examined regularly to ensure that they are free from obstruction.
- Storage and handling methods of lithium batteries should be inspected frequently in cross inspections
- Lithium Battery Safe Handling and Storage methods should be included in department specific orientations. Distribute Lithium batteries procedures and work instructions as soon as practicable and ensure all those involved with their use are competent in their duties handling & storing batteries
- Lithium Battery Safe Handling and Storage methods should be included in safety meeting discussions
- Crew members need to be made aware of the MSDS's for lithium batteries
- Ensure procedures for handling a cell anomaly are understood and practiced by emergency teams
- Lithium battery emergency response and safe handling training should be provided to all crew involved in handling lithium batteries and devices using lithium batteries.

New technology and development in stored energy devices (batteries) offer different alternatives to many onboard systems being used on vessels. Each battery is constructed differently and requires special handling and safeguard procedures. Know the type of battery you are using and consult the manufacturer's safety and handling instructions before installing, charging or placing in service.

Lithium batteries are not designed to be recharged. Lithium Ion batteries are designed to be recharged. Make sure you know which type you are using.

- 1) Manufacturer's instructions should be strictly adhered to with regards to charging of lithium batteries. Be aware that some lithium batteries are not designed for recharge.
- 2) Never short-circuit a lithium battery.
- 3) The following PPE should be available when working with Lithium Batteries:
- 4) Face shield, butyl rubber gloves, acid gas vapor mask, rubber apron, and class-D fire extinguisher.
- 5) Lithium batteries are transported and stored under regulated and usually restricted conditions. Consult the battery manufacturer or original shipping containers for exact storage and use/care instructions.
- 6) It is important to follow instructions as posted on the battery manufacturers MSDS for firefighting measures

- 7) Do not expose lithium batteries to moisture, except when required to in order to keep cool in case of fire. Protect individual batteries from contacting any metal source (including other lithium batteries) during storage.
- 8) Used lithium batteries can be unstable and dangerous. They should be as much as possible stored away from normal work areas or passage ways in a designated and purposed designed container. Pack used batteries so that they are insulated from each other and put them ashore at the first opportunity. Lithium batteries must be processed through an approved disposal agency.
- 9) Ensure support vessel has equipment and knowledge of how to handle lithium batteries in transit and how to handle any emergency.
- 10) If a cable incident should occur causing birds to reach depths in excess of 300 m (1000 ft.), it should be assumed that a hazardous condition may exist due to the possibility of lithium reactions from damaged batteries. In this event, great care should be taken when retrieving the affected birds. In the event of a strong suspicion that a lithium battery in a cable device already on board is dangerous it should be disposed of overboard immediately, if it is safe to do so.

5.3.2.2 Lithium Fires

If battery contents burn, a caustic smoke, containing lithium oxide will form. Avoid skin contact and inhalation. Wear full protective clothing including a helmet; a positive pressure, self-contained breathing apparatus (SCBA); a bunker coat and pants; a face mask; and a protective covering for exposed areas of the head.

Water may be used to extinguish packaging fires if batteries have not ruptured; water is not an effective extinguishing agent for a lithium battery fire.

For small fires involving the battery [extinguishing] media such as Lith-X or copper powder may be used, but should be applied with a long handled tool. Do not use CO₂ or Halon directly on a battery fire as the exposed surface of the contained lithium may react with these materials.

For larger fires involving lithium batteries, copious amounts of water may be applied, from a safe distance, to boundary cool & control the fire and protect adjacent materials and facilities.

5.3.2.3 Lead - Acid Batteries

- 1) Acid electrolytes are highly corrosive. Immediate remedial action should be taken to wash off any accidental splash on the person or on equipment. Hands and clothes should always be washed as soon as the work is completed.
- 2) To neutralize acid on skin or clothes, ample quantities of water should be used.
- 3) Goggles, rubber gloves and a protective apron should be worn when acid is handled.

5.3.3 Storage and Handling of Gasoline

- 1) Containers storing or transporting gasoline and other flammable liquids must be clearly marked, allowing for identification of the contents.
- 2) Areas where gasoline and other flammable liquids are being stored or transported should be clearly marked and designated as “NO SMOKING”.
- 3) Fumes from empty or partially empty storage or transport containers can be highly flammable and should be handled accordingly.
- 4) Accidental mixture of flammable liquids should be prevented. Gasoline mixed with fuel oil may change the flash point sufficiently to make the fuel oil hazardous in ordinary use.
- 5) Gasoline and other flammable liquids should be stored in open or well ventilated areas, away from sources of ignition or heat (including sunlight), with quick access to overboard disposal in case of emergency. Extinguishing agents should be placed close at hand for firefighting situations.
- 6) In case of a spill, appropriate means of spill containment should be available.

5.3.4 Explosives

In the event that a specific marine operation requires the use of explosives, please refer to the IAGC Land HSE Manual for proper transport, handling, storage, and detonating guidelines.

5.4 Ocean Bottom Operations

As a minimum vessel-to-vessel communications, emergency response (including MOB, fast recovery systems, and medivac) should be reviewed to ensure they are in place and functional. Additionally, project specific hazards should be assessed and mitigation measures put in place to ensure safe operations.



5.4.1 Deployment Operations

The following points may be used as a guide in the design and assessment of safe OBC deployment operations.

- 1) Prior to deployment or recovery of any equipment a tool box meeting should be held with all personnel involved, via radio if it is not possible to collect all personnel in one place

- 2) Check the operation and condition of all components of the cable deployment system before beginning work. The checklist for this procedure should include ties, axles, cable trays, hydraulic power and hoses, together with any vessel specific equipment not mentioned. A high voltage hazard exists on some bottom cables.
- 3) Operation of communications and video equipment between the back deck, instrument room and bridge must be checked. Deployment should not begin without adequate communications, preferably a hands-free system.
- 4) The hydraulic steering and deployment equipment should be operated by or under close supervision of, a properly trained person. The operator should have good line of sight to the working deck and other deployment crew at all times during the operation.
- 5) A check on expected weather conditions, water depth, obstructions and vessel traffic should be made before commencing any marine geophysical operation.
- 6) The watch officer must monitor all vessel traffic in the area. Instrument room and back deck personnel should be warned of any situation that might involve a course change, procedure change or other evasive maneuver.
- 7) Individual company specific procedures should be used when loading cables, etc., into any deployment device.
- 8) Correct personal protective equipment should be worn, including a life jacket, non-slip safety footwear, wet weather gear, safety glasses and hard hats and gloves.
- 9) All personnel not involved in the deployment operation should be clear of the working deck.
- 10) Personnel should not position themselves in the path of or in the bight of the deploying cable as it is fed off the deck.
- 11) When launching buoys, personnel should keep clear of coiled rope on deck. Personnel must not stand in a bight of rope.
- 12) Where possible, edge protective chains or railings should be in place when crew is working on exposed cable decks.
- 13) Safety harnesses and anchor points should be provided at all positions where personnel will deploy or recover equipment. Harnesses should be worn where conditions dictate.
- 14) All cables, modules, ropes and buoys should be securely connected before commencing deployment.
- 15) Working decks should be kept clear of debris and washed down after deployment.
- 16) Means of severing the cable in an emergency should be provided at the point of deployment.
- 17) A procedure should be in place for a quick stop in case the cable gets stuck/snags during deployment.

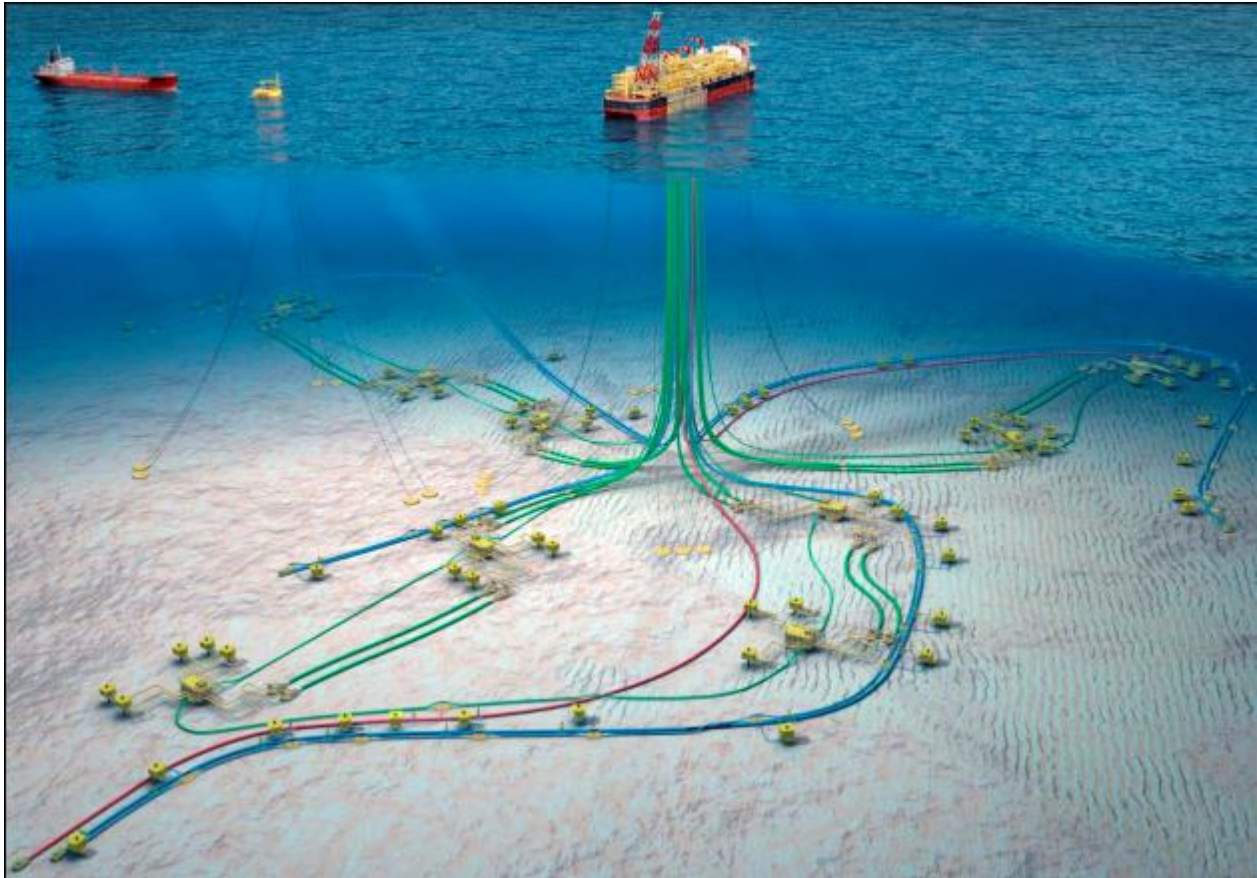
5.4.2 Recovery Operations

- 1) All personnel must understand the procedures before recovery of any equipment. Check expected weather conditions, water depth, obstructions and vessel traffic before commencing any marine geophysical operation.
- 2) Recovery equipment, hydraulics and communication equipment should be checked before commencing operations. Excellent lines of communication should exist between the Helmsman, the back deck crew and an experienced geophysical crew member who should be stationed on the bow or at the position the cable comes onboard.
- 3) The watch officer must monitor all vessel traffic in the area. He should be fully aware of how much equipment is being recovered and the expected duration.
- 4) Ropes and cables under tension are potentially dangerous. All personnel should stand in a protected position. When recovering equipment, care must be taken regarding the tension of cables and ropes.
- 5) The bridge should be informed when recovery is complete.
- 6) When working on deck after recovery, personnel should not stand on built up coils of cable in case of collapse.
- 7) When work is complete, all tools and equipment should be stowed and secured.

5.5 Ocean Bottom Nodal Surveys

Many aspects of Ocean Bottom Node (OBN) are similar to Ocean Bottom Cable (OBC) operations. Node operations usually involve several vessels, e.g. node deployment and recovery vessel(s), source vessel, and support vessels. There are several methods of deploying nodes to the seabed and they include ROV, planting frames, ROAV and straight drop. As node technology is relatively new, the procedures and methods are constantly evolving for better and safer performance.

The standard practice of good communication between vessels and structures is paramount. Emergency response procedures in the same format as for OBC should be documented and practiced on a regular basis. The additional risk of transiting around surface and sub-sea structures with descending cables for the deployment device and ROV should be addressed and mitigating measures put in place to reduce the risk of entanglement or damage to the structures or the vessels equipment.



5.5.1 Deployment Operations

The same points used for OBC can be incorporated into OBN survey work when designing and assessing for safe operations, with the addition of the following points:



- 1) Close liaison must be established with any surface assets in the area, as once the deployment equipment and ROV are deployed the manoeuvring ability of the vessel is strictly limited. A field specific PTW from the OIM is often required.

- 2) Full and concise checks should be made of all assets entering the water so as to reduce the possibility of oil leakage at depth causing an environmental impact on the area.

- 3) Close communication between Seismic and maritime is needed at all times to

ensure correct speed, course and depth. This will be constantly changing to allow optimum use of the assets.

- 4) Davit or crane operations should be part of the PTW system if using these to deploy the equipment.
- 5) All hydraulics should be serviced and personnel made aware of the dangers of working in close proximity to hydraulic equipment.
- 6) No one is to stand under or behind a suspension cable under tension.

5.5.2 Recovery Operations



The same standards and procedures for deployment are used for recovery with the addition of the following:

1. Assets recovered from depth may be under extreme pressure, care must be taken when approaching and working on the nodes and ROV in the first instance.
2. All oils used in the deployment and recovery of nodes should if possible be environmentally friendly or at the least biodegradable so as to minimise any impact in the event of a leak in water.

5.5.3 Contingency Procedures

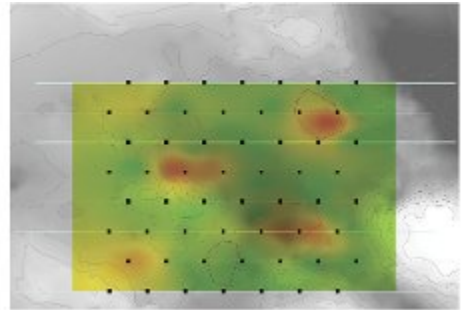
1. Procedures must be in place and practiced for the safe and uneventful recovery of the assets in an emergency, or unplanned repairs, including necessary controls for night-time events.
2. Marine animals with the ability to sting or bite may be encountered on the nodes and ROV. Training and procedure for safely disentangling flora and fauna should be in place.
3. There is a possibility of dropping a node whilst deploying or recovering. A good dropped object policy and communication with the OIM is essential to prevent any possibility of damage to subsea assets.
4. In-water assets need to be readily identifiable to the company and in high visibility colours.

5.6 Controlled Source Electromagnetic Survey Operations

Electromagnetic (EM) Operations:

Marine EM reduces exploration risk and increases the likelihood of finding offshore hydrocarbons. The products and services are used by a range of exploration and production companies and government agencies for a variety of purposes including:

- Provision of early indications of hydrocarbon prospectively in frontier areas
- Finding bypassed and satellite fields in mature areas
- Testing and ranking seismic prospects
- Prioritizing drilling locations
- Improving delineation of reservoirs



An EM survey is a geophysical tool for mapping electrical resistivity in geological structures beneath the seafloor. The most common method in the industry today is Controlled Source ElectroMagnetic (CSEM) which involves transmitting a signal with a towed, high power, low frequency EM transmitter (source) close to the sea bed and measuring the resultant signals with an array of previously deployed autonomous ocean bottom receivers. This method can be employed in water depths up to 5 km.

Magneto telluric data is commonly collected by the same instrument before and after the controlled source is applied.

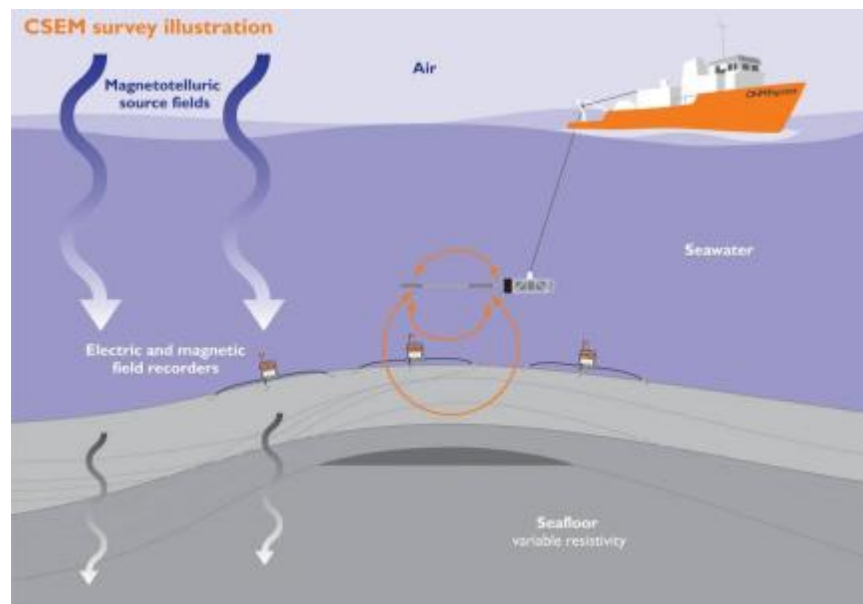
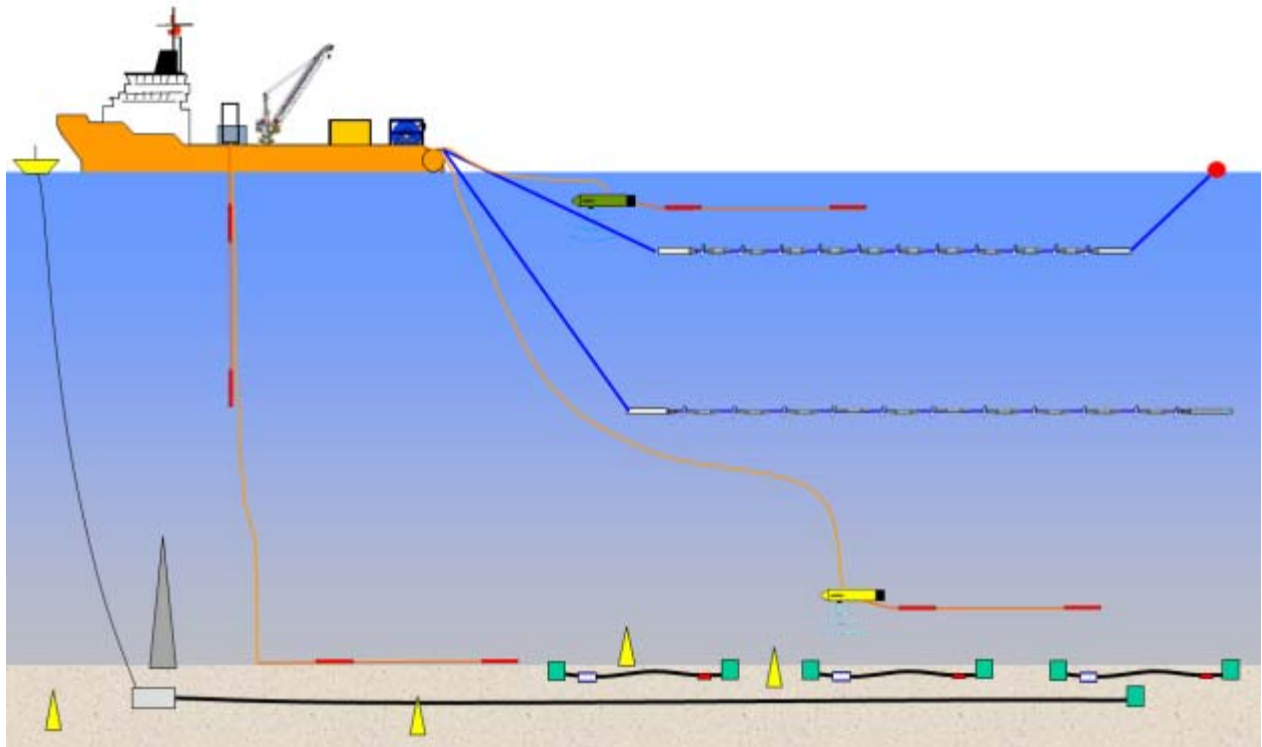


Figure 1 Schematic CSEM survey with an HED source. The source is towed close to the seafloor and transmits a low frequency EM signal to an array of seafloor receivers. By studying the received signal as the source is towed over the array, the resistivity characteristics of the seafloor can be determined.

Composite Illustration of several EM Acquisition Configurations



Hazards

- Deployment and recovery of sea bottom nodes involving crane operations.
- Deployment and recovery of Sub-sea transmitter involving crane operations.
- High voltage used to power the subsea transmitter.



Figure 2 Ocean bottom node deployment



Figure 3 Ocean bottom node recovery



Figure 4 EM high powered source spread

Schematic view of a controlled source electromagnetic (CSEM) survey. A horizontal electric dipole (HED) is towed above receivers that are deployed on the seafloor. The HED emits a continuous EM signal which is recorded by the receivers. Yellow arrows indicate the direct wave that dominates on the very short offset, while the red arrow indicates the energy that has penetrated the sub-surface. The green arrow shows the airwave, which will dominate short, medium or long offsets, green arrow shows the airwave.

5.7 Gravity Measurement

Gravity surveys record the changes in the gravitational acceleration as the ship passes over the earth's surface. Gravity surveys are very often undertaken as part of another survey operation such as 2D or 3D seismic surveys. The gravity sensors themselves do not pose any unusual hazards and are located onboard the vessel. However the addition of a new crew member and equipment can cause unsafe conditions to emerge.

- a) Ensure that the gravity operator can assess the equipment safely at all times. If there are access restrictions these should be explained during the operator's safety induction.
- b) Gravity equipment is heavy with individual instruments weight 100kg: Give consideration to avoidance of manual handling when selecting an appropriate site for the gravity meter.
- c) The gravity meter requires an electrical connection and this should be considered when selecting an appropriate site for the gravity accelerometer

5.8 Magnetic Data Acquisition

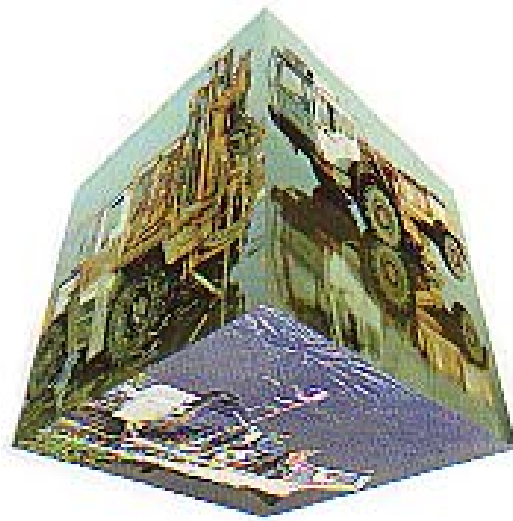
Magnetic surveys record the earth's magnetic field as the ship passes over the earth's surface. Magnetic surveys are very often undertaken as part of another survey operation such as 2D or 3D seismic surveys. The magnetic effect of the vessel means that the sensor must be deployed into the sea, ideally at a distance of three times the length of the vessel. As magnetic surveys are acquired from non-dedicated vessel it is important to ensure that the procedures are developed specific to the vessel. The procedures will have similarities with Towed Seismic but in particular the following should be considered:

- a) How and who will deploy and recover the tow fish, the magnetic operator should not be allowed to do this alone or without training in ship specific equipment
- b) What are the hazards associated with the other in-sea equipment and what procedures are needed to avoid entanglement
- c) All equipment used to deploy and recover the tow fish is suitable for the task; manual handling should be avoided but where required a suitable number of crew should be involved appropriate to the weight.

5.9 Transition Zone/Telemetry Operations

Please see the IAGC Land HSE Manual for guidance on these types of operations.

6. VESSEL OPERATIONS



6 VESSEL OPERATIONS

6.1 General



Safety on deck of a geophysical research vessel is the responsibility of all personnel working on or traversing through, the deck area.

Designated symbols and colors should be displayed in all appropriate hazardous areas. This includes the “no smoking” area, fire extinguisher types and areas where ear, eye and foot protection is required.

It is up to each company to define their own smoking policy. Careless smoking habits are a major cause of fires.

It is recommended that “smoking” areas are designated and that all other areas are therefore acknowledged to be “No Smoking” areas.

Placards must be prominently displayed in all areas that require hard hats, lifelines or other types of protection. Safety zones should be clearly marked.

Luminescent arrows should be placed at close intervals along the deck to indicate the route to the nearest exit.

Crew members and visitors must treat deck areas as hazardous and adhere to the minimum guidelines listed below.

- 1) Approaches to ladders and stairs should be at least 400 mm (16 in.) wide, unobstructed and treated with non-skid material.
- 2) Fixed ladders, landings and cages, etc., should be inspected frequently and properly maintained. Those in holds should be examined for damage immediately after the discharge of cargo. Adequate illumination should be maintained.
- 3) All watertight doors should be closed and latched while at sea and opened only for the passage of personnel. Door and hatch gaskets should be kept clean in order to maintain watertight integrity.
- 4) Sand or other suitable substances should be spread over areas made slippery by snow, ice or rain. The utmost care must be taken in crossing such areas and particularly in using gangways, stairs and ladders under such conditions. Spillage of oil, grease, etc., should be cleaned up immediately.
- 5) When rough weather is expected, lifelines should be rigged across open decks.
- 6) Permanent fittings that may be trip hazards, such as eye pads on deck, lashing points and projections should be painted a conspicuous color in contrast to the background so that they are

more easily seen. It may be useful to pad a sharp projection. Good illumination should be maintained.

- 7) Machinery guards must be kept in place and in good condition.
- 8) Cranes, winches and hydraulic equipment should only be operated by or under the supervision of trained personnel.
- 9) All loose objects should be secured immediately after they are received on board, no matter what type of weather may be expected.
- 10) Preventive maintenance on equipment, as recommended by manufacturer, should be practiced to ensure that the equipment is working as intended.
- 11) Guardrails or fencing should be of adequate strength, good construction, free from sharp edges and properly maintained.
- 12) A tool should not be placed where it can be accidentally knocked off to fall on someone below nor should tools be carried in pockets from which they may easily fall. A belt designed to hold frequently used tools securely in loops is recommended.
- 13) Tools should be handled with extra care when hands are cold or greasy and where the tools themselves are greasy.
- 14) Ropes should be kept free of contamination by chemicals (rust removers and paint strippers may be particularly damaging) and not stowed close to any source of heat and out of direct sunlight. Any accidental contamination should be reported immediately for cleansing or replacement.
- 15) Persons who are working aloft or in any other area where there is a risk of falling more than 2 m (6ft.), should wear a safety harness with shock absorber attached to a lifeline of suitable length. If the work is outboard of the rails, Personal Flotation Devices (PFDs) should be worn along with the safety harness, the lifeline should always be attached directly to the vessel and not to scaffolding or other temporary structures. A lifebuoy with sufficient line attached should be kept ready for immediate use. Permit to Work requirements should be reviewed prior to commencing work. A working at height procedure should include the use of a watchman and a rescue system in place. The area under the work should be cordoned off when appropriate.
- 16) A man working at an extreme height cannot give his full attention to the job and, at the same time, guard himself against falling. Arrangements should be such that he can be certain that he is working from a secure platform and is protected from falling. Similarly, arrangements should be such that equipment or tools cannot fall.

6.2 Boat Transfers

6.2.1 Boat to Boat

A reminder that if a person feels that an action is unsafe then they should report it, and have the action reviewed within a risk assessment.

The type and size of craft, together with company or vessel procedures, will determine which methods are used. The method used should be part of a documented and detailed plan that is reviewed and discussed before any transfer operations are undertaken. As the exchange craft comes alongside, practical problems can arise due to the gap created by fenders between the vessels. These should be considered in your vessel specific procedures.

While the preferred method of personnel transfer is by small boat, if it is necessary to carry out personnel transfers at sea using a standby or crew boat the following points should be taken into consideration:

- 1) Before any exchange craft comes alongside, adequate communication lines must be open between both bridges. Clearance should be obtained from both vessels' Masters before the transfer commences.
- 2) Clear both points of transfer of all loose items and obstructions.
- 3) Surfaces for the transfer areas on the vessels should be non-slip.
- 4) Sufficient personnel should be available to give assistance to the crew members transferring. Poor or non swimmers should be identified and treated appropriately.
- 5) When vessels have a significant height difference, a Pilot's ladder should be used.
- 6) When vessel transfer locations are similar in height, a swing rope system could be used.
- 7) When using a swing rope, it should be knotted and checked as part of a vessel's regular maintenance program. Personnel using the rope must hold on with both hands.
- 8) Regardless of the method used, secondary lifelines should be in place.
- 9) Instruct personnel on transfer procedures. One person at a time should be transferred.
- 10) All transferring personnel must wear life jackets, proper footwear and appropriate clothing. If necessary, use immersion suits. Personal Locator Beacons (PLBs) should be considered and used if available.
- 11) It is recommended that transfers should be made during daylight with good visibility.
- 12) Transfers should take place on the leeward side of the mother vessel if possible.
- 13) No person should be accompanied by luggage when crossing over.
- 14) Personnel are to clear transfer points as directed by the reception personnel.

6.2.2 Shore Landings

In some operating areas, shore landings will be required using the Fast Rescue Craft (FRC) or workboat for the transfer of equipment or personnel. When shore landings are planned, the following should be considered:

- 1) Scout the landing area, both visually and using local charts taking note of the coastline and possible hazards, such as rocks, jetties, sandbars and any other type of outcropping.
- 2) Secure all equipment and brief passengers in the-operation to take place.

Beach landings should only be considered if it is an operational requirement and no other practical alternative is available. A risk assessment should be made.

- 3) After reaching the shore, the boat should be secured before offloading.
- 4) In the event of a landing where the boat cannot reach the shore and personnel are required to enter the water and wade ashore the following points should be considered:
 - a. Water depth (sufficiently shallow such that it does not require personnel to swim)
 - b. Stable and shallowing water bottom
 - c. Proper attire, including shoes
 - d. Water temperature
 - e. Caution should be used when working in area containing dangerous marine life, such as sharks, sea snakes, stone fish, sting rays, jellyfish or coral.

6.2.3 Personnel Basket Transfer

Industry best practice does not recommend this type of transfer, however, if it becomes necessary to transfer by means of a personnel basket, the following precautions should be observed:

- 1) The crane and the operator should be certified and should fulfill all requirements for personnel basket transfer.
- 2) A survival suit is to be worn in cold water regions.
- 3) A Personal Flotation Device (PFD) is to be worn.
- 4) Deck crew - preferably two - must be available to assist on both the vessel and the rig.
- 5) Luggage should be stowed in the basket center to ensure that both hands are free.
- 6) Personnel transferring should be evenly distributed around the baseboard to ensure maximum stability.
- 7) Personnel should stand outside the basket with feet apart on the board and the basket securely gripped with both arms looped through the ropes.
- 8) Ample tag lines should be used to minimize the swing of the personnel basket.
- 9) At all times and especially when the personnel basket is not visible to the crane operator, a designated signal man should direct the operator to completion of the lift.

- 10) When the officer in charge is satisfied that all is ready and, at the appropriate moment with regard to the movement of the ship in a seaway, the basket should be lifted clear of the vessel and then swung up and out as quickly as possible before being carefully hoisted up to the rig.
- 11) A rescue boat should be ready on station.

6.3 Small Boats (Launch and Recovery)



A kill-cord should be attached to the coxswain immediately after the boat is clear of critical operations. A spare kill-cord should be available or an alternative over-ride system. PLBS should be used if available.

- 1) "Small boat" is intended to include all work boats, MOB's, and FRC's.
- 2) Small boats may be deployed only with the permission of the Captain. It is recommended that a minimum of a Coxswain and two additional persons should be used to operate small boats. The Coxswain should be qualified for small boat operations and a second person should be capable of handling the boat.
- 3) Another suitable vessel should stand by as a safety vessel. This vessel may be a high-speed rescue boat, a platform standby boat, a guard boat or any other standby boat. If the vessel is a high-speed rescue boat its deployment and response time should be in accordance with SOLAS Standards.

- 4) Lifeboats are specifically excluded from being assigned as routine standby rescue boats.
- 5) Personnel should not be permitted to leave the small boat to enter the water without the Captain's permission.
- 6) Life jackets must be donned prior to boarding the boat and must not be removed until back on board the mother vessel or onshore. Immersion suits must be worn as appropriate. Head protection should be worn during launching and recovery
- 7) In towed seismic operations, small boat deployment after dark or in limited visibility should only be permitted in an emergency and only if the boat is equipped with the appropriate lights and navigation equipment.
- 8) The small boat and launch point should have radio communication with the bridge. A regular communication plan should be agreed to with initial communications being established as soon as the small boat is embarked.
- 9) The bridge should monitor small boat operations at all times.
- 10) Diesel engines are preferred over gasoline engines.
- 11) Do not exceed the maximum allowable capacity of any boat. Sea conditions and weather must always be considered.
- 12) Toolbox meetings should be carried out prior to any small boat launch and recovery
- 13) Engine kill-cords (dead man's cords) should be used according to company procedures.
- 14) A pre-launch checklist covering, but not limited to the following, should be used:
 - a. Launch procedures
 - b. Equipment required while underway
 - c. Backup plan if problems arise
 - d. Recovery procedures.
- 15) An appropriate equipment inspection checklist should be completed prior to launch:
- 16) Crew should not board until engine, engine controls, radio including backup radio and equipment have been checked and are serviceable.

6.4 Environmental Awareness

It is the responsibility of all individuals on the crew to conduct themselves in such a manner so as to mitigate harm to the environment in which they operate.

Geophysical research crews should be operated in a manner that is consistent with company or vessel specific procedures and in accordance with all international or local regulatory requirements pertaining to environmental compliance.

6.4.1 Waste Management

Each vessel has a waste management plan for segregation, processing, storing and disposal of waste. Each vessel complies with MARPOL (Maritime Pollution Regulations). As part of the segregation plan, labeled waste containers are available and should be used.

6.4.2 Hazardous Material Spills

If such a spill is caused or observed, it should be immediately reported to the Master and Chief Engineer, in accordance with the vessel specific procedures.

Vessels will have documented procedures to mitigate any possible spills on board the vessel. In the event that a spill should occur, proper clean-up and containment materials will be available to prevent it from escaping to the sea.

Any over the side spills will be reported by the Master in accordance with company, vessel, international, or local regulatory requirements.

6.4.3 Air Emissions

Operating plans, procedures should consider the output from certain systems with regards to overall air emissions. In particular emissions from engines and power plants should be monitored for content and volume and should be in accordance with company, vessel, international, or local regulatory requirements.

6.4.4 Marine Mammals and Sea Life



Regulations involving seismic activity in the vicinity of marine mammals and other forms of marine life vary from country to country. Each vessel should be aware of the specific compliance requirements for the area in which they are operating.

Some common practices where marine mammals are known to be present include use of the following:

- soft starts for the airguns
- trained Marine Mammal Observers
- passive acoustic monitoring systems

6.5 Security and ISPS Code

Most vessels and ports must comply with the requirements of the ISPS Code (International Ship and Port Facility Security Code).

The vessel has a security plan as required by the ISPS Code and which must be complied with. Each vessel should conduct security drills.

6.5.1 In Port

While in port, the control of personnel entering and leaving a vessel is extremely important:

- 1) In the event of a fire or other major incident
- 2) To prevent loss due to theft
- 3) To mount an appropriate response to missing persons, if any
- 4) To prohibit unauthorized persons from boarding the vessel.

A gangway watch must be posted and the gangway never left unguarded.

6.5.2 At Sea

6.5.2.1 Piracy at sea

Vessels are to have piracy procedures in place as per the ISPS Code.

6.5.2.2 Interference by Special Interest Groups

Company or vessel specific procedures should be in place to deal with the event of interference from special interest groups. These procedures should be reviewed and discussed if such interference is suspected or anticipated.

Generally, a passive defensive approach should be taken so as to avoid direct confrontation with these groups. The interference should be documented and recorded (still or video) for any subsequent legal action that could arise at a later date.

6.6 Bunkering

- 1) Equipment utilized should be visually inspected prior to commencing any bunkering operations to ensure it is in proper working order.
- 2) Complete a safe bunkering checklist.
- 3) Coordinate position and expected weather conditions with refueling vessel.
- 4) Establish and maintain communication between all parties.
- 5) Ensure that only necessary people are in the vicinity of the bunkering operations.
- 6) Secure refueling vessel to vessel to be refueled.

- 7) Adequate mooring ropes and fendering to be attended by both vessels for the duration of the operation.
- 8) Hoist red warning signals on both vessels.
- 9) Post "Smoking and Naked Lights Prohibited" signs and inform crew by intercom that smoking and hot work is prohibited on deck.
- 10) Ensure plugs are fitted in the fuel containment trays under the bunkering point and tank air vents.
- 11) Have absorbents/spill kit available at bunkering point.
- 12) Connect refueling hose to receiving vessel correctly.
- 13) Monitor refueling process so that there are no hose leaks or spillage.
- 14) Disconnect fuel hoses carefully when complete and fit hose end caps.
- 15) Transfer the refueling hose back to the refueling ship.

6.6.1 In Port

During bunkering operations the company's procedures should be complied with and they should include the following as a minimum:

- 1) Complete a safe bunkering checklist.
- 2) Post "Smoking and Naked Lights Prohibited" signs and inform crew by intercom that smoking and hot work is prohibited on deck.
- 3) Post red warning signals (red flag by day or red light at night).
- 4) Ensure that plugs are fitted in the fuel containment trays under the bunkering point hose connections, and tank air vents.
- 5) Have absorbents/spill kit available at bunkering station.
- 6) Check communications between engine room, bridge and bunkering point.
- 7) Open all valves on tanks to be filled.
- 8) Connect all hoses.
- 9) Check meter.
- 10) Ensure that there is always someone on deck checking for hose leaks and overflow from tanks.
- 11) Commence loading.
- 12) Comply with all local regulating agencies, contractors and MARPOL 73/78 requirements.

6.6.2 At Sea

Bunkering at sea should preferably be carried out during daylight hours. Breakaway valves should be used when bunkering off shore.

6.7 Electrical Equipment and Wiring

Good workmanship and proper materials should be used and all wiring will be installed according to the classification society regulations. Only qualified and approved personnel should work with electrical equipment and wiring.

1. Every circuit should be protected against over current by automatic tripping devices.
2. Electrical joints and connections should be of proper construction with respect to conductor size, insulation and mechanical strength and protection.
3. Electrical equipment cabinets and metal housings could cause danger. Electrical distribution cabinets should only be opened by authorized personnel.
4. Effective means, suitably placed for immediate operation, should be provided so that all voltage may be cut off from every installation and circuit to remove and prevent danger.
5. For every electric motor, an efficient means of disconnection should be readily accessible, easily operated and placed to prevent danger.
6. Every piece of equipment that requires operation or attention by a person in normal use should be installed so that adequate and safe means of access and working space are provided.
7. No additions or alterations temporary or permanent should be made to an existing installation, except by an authorized and competent person.
8. All unsafe appliances, wires and electrical apparatus should be reported immediately to the electrician or supervisor and be removed from service.
9. Treat all wires as live wires. Do not touch hanging or broken wires. Place a warning sign and notify a supervisor or electrician immediately.
10. Use hand-held portable battery lights when working in damp areas or in metallic tanks. Ground Fault Current Interrupt (GFCI) protection must be used in wet areas.
11. De-energize and tag or lock out all circuits before working on lines. Under certain conditions, low voltage can kill.
12. Any electrical distribution box which reveals live terminals when opened shall be securely fastened closed to prevent access. All such boxes shall carry electrical hazard signs.
13. Personnel should be aware that Uninterruptable Power Supplies (UPS) systems store large amounts of energy and can be dangerous even in the event of a black out.

6.8 Lockout/Tagout



Lockout is the process of blocking the flow of energy (electrical, pneumatic, hydraulic, gravitational, energy stored in springs, etc.) to a piece of equipment and keeping it blocked out. A lockout device is a lock, block or chain that keeps a switch, valve or lever in the off position.

Tags are used to support the lockout and are part of the complete process. The tag records who made the energy isolation (lock out) and when. The tag acts as a warning not to restore energy to or

restart the piece of equipment under lockout. Tags must clearly state: **DO NOT OPERATE** and it must be applied by hand.

When maintenance is needed on any electrical powered line, motor, equipment or fuel-powered engines, you should protect yourself and others from accidental turn-on. Accidents and deaths can occur when someone "thought" the machine or electricity was safely turned **OFF**.

There are ten steps to follow:

- 1) The person in charge should identify all parts that are to be shut down and which switches, equipment and people will be involved in maintenance, repairs or installation. At this time, the restarting procedures are planned with details written down for who starts it, when it happens and how it is carried out.
- 2) Advise everyone involved that a lockout/tagout procedure will take place.
- 3) Identify all power sources for the project. What makes it work? This includes identifying all hydraulic and pneumatic systems, spring, compressed air, gravity systems and all electrical circuits.
- 4) Every power source has its own procedures for lockout which may be accomplished by pulling a plug, opening a disconnect switch, removing a fuse, closing a valve, bleeding the line or placing a block in the equipment.
- 5) Each worker involved should have his own lock keyed differently from anyone else's lock. It should be identified with the owner's name, an assigned number or color code and the name of their department or company. Clips, chains and lockout boxes, which are available from locksmiths, electrical supply companies or through your company Health, Safety and Environment (HSE) or Purchasing Department may also be used. These lockout devices may only be removed by the individual placing the lock.
- 6) Tagout all the power sources and machines. Tags should indicate that the machine or circuit is out of order, the reasons for the lockout, time and date of lockout, your name, Tagging should be done by the person in charge and removed only after everyone's lock has been removed, the system tested and restart approved.

- 7) When locks and tags are in place, and before any work takes place, verify that there is an absence of energy in the system (zero energy state).
- 8) The person in charge should clear the area. Double check all the steps listed above. Remove locks, turn on power sources and operate any valves to prepare to test the system. With all workers safe and the equipment ready, remove the "out of order" tab before turning the power on.
- 9) Supervisors or persons in charge should have received "Permit to Work" training and people working for them have received adequate instruction in the system.
- 10) Adequate time should be allowed during shift changes to ensure effective transfer of information on outstanding permits.

6.9 Radio, Radar and Navigation

Permit to Work requirements should be reviewed prior to any work commencing.

- 1) Contact and exposure to radio and radar radiation from an antenna can result in severe burns and tissue damage. Inform the vessel's Master before installing navigation antennas or any other time personnel are going aloft. Lockout-Tagout all transmitters when personnel are aloft.
- 2) Only authorized personnel (except in emergency) will use radio, radar and navigation equipment.

6.10 Galley

The general health of the crew requires the provision of a well balanced diet, including adequate supplies of drinking water. It is important that certain standards be maintained in the galley for the preparation and serving of meals.

- 1) Persons employed in the preparation, cooking or serving of food or drink or in the handling of eating/drinking utensils must have undergone a medical examination and fulfilled the necessary health requirements. Followed up with periodic exams.
- 2) All persons engaged in the handling of food, drink or eating/drinking utensils are to:
 - Maintain a high standard of personal and communal hygiene.
 - Be aware of the danger of diseases spread by contaminated food.
 - Report sick when suffering from throat infections, stomach disorders, skin conditions or potentially contagious diseases.
- 3) A wash-hand basin with an adequate supply of hot and cold water with brush, anti-fungal soap and clean towel is to be provided. "Wash your Hands" notices should be displayed prominently in toilet areas.
- 4) Smoking is prohibited in all areas where food is prepared, handled or stored.
- 5) Clean protective clothing, e.g., long sleeves and hair covering and suitable footwear, is to be worn by all food handlers.

- 6) Food stocks should be inventoried and rotated to ensure that used by dates are not exceeded. Once opened, food containers should be properly sealed.
- 7) Food stocks should be inspected on delivery, any suspect or substandard items should not be accepted onboard and should be returned to supplier.
- 8) No waste food or refuse should be deposited or allowed to accumulate within any food room and any spillage of liquids or solids should be cleaned up immediately.
- 9) Kitchen utensils, sinks, cooking equipment and food preparation surfaces are to be thoroughly cleaned and sanitized after use.
- 10) The floors of all kitchens, annexes, food stores and ancillary areas are to be kept clean and dry. Any evidence of rodent or insect pest infestation is to be reported immediately to the head cook and Captain and appropriate action should be taken to control and contain the infestation.
- 11) All kitchen and dining areas should be completely sanitized each week. This includes stoves, freezers, refrigerators, range hoods, fans, tables, floors and non-refrigerated food storage areas.
- 12) Thoroughly wash all fruits and vegetables with clean water before eating raw or before cooking.
- 13) Decks and gratings should be kept free of grease, rubbish, ice, etc., in order to minimize slipping that may result in serious injuries, especially when hot liquids or glass and crockery are being carried. Any spillage should be cleaned up immediately.
- 14) Catering staff should not attempt to repair electric ranges and appliances. Defects should always be reported so that proper repairs can be made. The equipment should be taken out of use until it is repaired.
- 15) Use of water in hosing down and washing equipment in the galley can be very dangerous, particularly where there are electrical installations. Whenever the galley deck is washed down, power to an electric range and all electric equipment should be switched off and isolated from the supply and water kept from making contact with the electrical equipment.
- 16) Range guardrails should be used in rough weather. Pots and pans should never be filled to the extent that the contents can slop over when the ship rolls or turns.
- 17) The steam supply to pressure cookers, steamers and boilers should be turned off and the pressure carefully released before their lids are opened.
- 18) Fats should not be cooked down in ovens. It may overheat and catch fire. A thermostatically controlled fryer may be used for this purpose.
- 19) There should be covers for deep fat fryers that can be dropped in case of a fire.
- 20) For other fat or grease fires a fire blanket can be used. If a fire blanket is not available, a fire extinguisher should only be used with EXTREME caution. DO NOT USE A WATER FIRE EXTINGUISHER. Do not attempt to remove the container until it has cooled down to less than 35°C (90°F).

- 21) The power source for the galley area, including the ventilation system should be easily accessible and well marked for quick shutdown in the event of fire.
- 22) Any machine or equipment that is defective in its parts, guards or safety devices should be reported and taken out of service.
- 23) When a power-operated machine has to be cleaned or a blockage removed, switch off and isolate it from the power supply. Care should be taken to see the machine has completely stopped before the cleaning is begun.
- 24) Appropriate implements, not fingers, should be used to feed food into processing machines.
- 25) Electrical equipment should not be operated with wet hands.
- 26) Sharp instruments should be handled with care and not be left unattended. They should not be mixed in with other items for washing but cleaned individually and stored in a safe place.
- 27) The handles of knives, saws, choppers, etc., should be securely fixed and kept clean and free from grease. The cutting edges should be kept clean and sharp.
- 28) Proper can openers should be used to open cans; improvisations are dangerous and may leave jagged edges on the can.
- 29) Use of color coded knives and chopping boards is recommended to prevent the possibility of cross contamination.
- 30) Chopping meat requires undivided attention. The chopping block must be firm, the cutting area of the meat well on the block and the hands and body clear of the line of strike. There must be adequate room for movement and no obstructions in the cutting-stroke path. Particular care is required when the vessel is under way or in rough seas. Use of Metal protection gloves is recommended when chopping meat.
- 31) A falling knife should be left to fall, not grabbed. Quickly back away to protect your feet.
- 32) Refrigerated room doors should be fitted with both a means of opening the door and of sounding an alarm from inside. A routine testing of the alarm bell and checking of the door clasps and inside release should be carried out weekly.
- 33) Refrigerated room doors should be secured open while stores are being handled. Refrigerator and freezer temperatures should be monitored and logged twice daily.
- 34) Cold stores or refrigerated rooms should not be entered if it is suspected that there has been a leakage of refrigerant. A warning notice to this effect should be posted outside the doors.
- 35) All stores and crates should be stowed securely so that they do not shift or move while the vessel is underway.

36) Good ventilation should be maintained to reduce heat and humidity in the galley and food service areas.

37) Plastic gloves should be worn as much as possible while handling food products.

6.11 Engine Room

Good housekeeping in the engine room and machinery spaces is critical for the proper operation and maintenance of essential equipment, and to mitigate the potential for fire.

1. All exhaust pipes and fittings which by their location and temperature present a hazard must be adequately shielded or insulated. The insulation of heated surfaces should be properly maintained, particularly in the vicinity of oil systems.
2. Where high-noise levels in a machinery space or the wearing of hearing protectors may mask an audible alarm, a visual alarm of suitable intensity should be provided to attract attention and indicate that an audible alarm is sounding. This should take the form of a light or lights with rotating reflectors.
3. Alarm systems should be tested on a regular basis. Specific engine room alarms should be tested as per the planned maintenance system. However, it is recommended that the main ship alarms (fire/MOB) be tested biweekly.
4. The source of any oil leakage should be located and repaired as soon as practical.
5. Waste oil should not be allowed to accumulate in the bilges. Any accumulation should be disposed of in accordance with oil pollution regulations at the earliest opportunity. Bilges should, wherever practicable, be painted a light color and kept clean and well illuminated in the vicinity of pressure oil pipes so that leaks may be readily located.
6. Engine room bilges should at all times be kept clear of rubbish and other substances so that mud-boxes are not blocked and the bilges may be readily and easily pumped.
7. Great caution is required when filling any settling tank to prevent overflow.

Remote controls, fire valves for stopping machinery pumps or for operating oil-settling tank quick-closing valves should be tested regularly.

8. Inexperienced personnel should not enter or remain in an unmanned machinery space without permission from the engineer-in-charge.
9. Notices of safety precautions to be observed by persons working in unmanned machinery spaces should be clearly displayed at all entrances to the space. A warning should be posted that machinery may suddenly start.
10. Unmanned machinery spaces should be adequately illuminated at all times.

11. When machinery is under bridge control, the bridge should always be advised when a change in machinery setting is contemplated by the engine-room staff and before reverting to engine room control of the machinery.
12. The compartment in which refrigeration machinery is fitted should be adequately ventilated and illuminated. Both the supply and exhaust fans should be kept running at all times.
13. The atmosphere in any enclosed spaces not continuously or adequately ventilated may contain toxic or flammable gases or be deficient of oxygen to the extent of being incapable of supporting human life. "Permit to Work" requirements should be reviewed prior to commencing work.
14. If carbon dioxide or any other fire smothering gas has been discharged to extinguish or prevent a fire, nobody should re-enter the area until authorized to do so.
15. The seriousness of fire in machinery spaces cannot be overstressed. All personnel should be fully aware of the precautions necessary for fire prevention. Such precautions should include maintaining clean conditions, the preventing of oil leakage and the removing of all combustible materials from vulnerable positions.
16. Suitable covered metal containers should be provided for the storage of waste, cleaning rags or similar materials after use. Such containers should be emptied at frequent intervals and the contents safely disposed of.
17. Wood, paints and spirits should not be kept in engine rooms or machinery spaces.
18. All electric wiring should be well maintained and kept clean and dry. The rated load capacity of the wires and fuses should never be exceeded. Insulating mats shall be placed in front of switchgear panels.
19. Personnel using hydraulic and pneumatic equipment should be fully conversant with the proper procedures for its safe operation. Operating instructions should be followed at all times.
20. Operators should ensure that the system operating pressure shown on the pressure gauge is at the recommended level.
21. Prior to a hydraulic system activation or deactivation, checks should be made to ensure that there is no air trapped in the system and that there are no external leaks. Trapped air causes erratic action that can lead to injury or damage to the installations or equipment.
22. Only the correct grade of hydraulic fluid should be used for topping up a hydraulic system. The correct grade should be clearly posted.
23. Any spillage of hydraulic fluid should be cleaned up immediately. Some fluids have a mineral oil base and should be thoroughly washed off the skin as soon as possible.
24. Any person entering the engine room or machinery compartments must wear hearing protection.

25. The engine room log, fluid transfer log, and maintenance logs shall be kept up to date.
26. All mechanical equipment should have proper guards around any moving parts.
27. All deck plates should be kept securely fastened.

6.12 Cranes and Lifting Devices



PTW forms and toolbox meetings should be completed as appropriate before any lifting operations are conducted.

1) Only competent and authorized persons shall operate lifting equipment. Assisting personnel should understand their duties.

2) The operator should complete the company's check list prior to any lifting operations and prepare a lift plan. Any defects must be repaired before the crane is used.

3) All cranes, winches other hoisting devices and auxiliary handling equipment shall be certified and checked at specified intervals. The Working Load Limit (WLL) must be prominently displayed on the boom of any crane and clearly marked on all other lifting devices.

Note: in some areas the Working Load Limit (WLL) may be displayed instead of SWL.

4) The maximum capacity and boom angle of the crane must be clearly marked and must not be exceeded.

5) Load limiting protection systems should be in place.

6) Crane hooks shall have safety latches.

- 7) The crane operator and auxiliary personnel must be mindful of overhead obstacles and hazards that may contact the crane boom. Power lines represent a serious hazard that must be avoided.

- 8) A hand signal chart shall be mounted to the crane foundation or other location close by and visible to the operator. A sample chart has been provided in this manual; however specific signals may vary from one operation to the next.
- 9) When appropriate, a qualified, designated signal person should work with the crane operator and standard signals will be used. Normally all signals should be given by the signal person but the operator should obey an emergency stop signal given by anyone. Toolbox meetings are recommended prior to commencing any lifting operations.
- 10) The operator must properly secure the crane and boom before going off duty or when shutting down operations. A tag should be placed on the controls and the Master or Chief Engineer notified if any defects are known.
- 11) Personal Protective Equipment (PPE) must be worn by all personnel handling cargo and working around cranes. This equipment must include hard hats, safety boots with non-slip soles, leather gloves and any other safety equipment that might be required to handle any other specific cargo.
- 12) Correct cargo handling tools must be used and these tools must be regularly checked and maintained.
- 13) Never perform a hazardous job alone. Get help before trying to cope with a situation by yourself.
- 14) Always watch the loads in the process of being lifted by crane. Your eyes should be on the cargo until it is on deck and disconnected from the crane.
- 15) Never get under a suspended cargo load and never get any part of your body between unsecured objects (pinch points)
- 16) Tag lines should be used to guide all loads regardless of weight, load size or sea conditions.
- 17) When strain is being placed on a rope, line or cable, never stand in the path it would follow should it part. Never stand in the path the load would follow should the lifting cable break.
- 18) Never ride on a load being hoisted.
- 19) Use appropriate procedures when handling gas cylinders and any other substance which may be considered hazardous.
- 20) Open cargo-loading hatches must have suitable fencing around the exposed opening. Hatches should be securely closed immediately after the loading is completed.

6.12.1 Slings and Lifting Appliances

Only certified slings and lifting appliances should be used for handling loads.

6.12.2 Webbing Straps

- 1) Safe working load, identification number and date when the strap was put in service should be clearly indicated.

- 2) Straps should be free from any significant defects.
- 3) Additional protection should be provided when lifting loads with sharp edges.

6.12.3 Wire Rope Slings

- 1) **Do not** use knots to make slings.
- 2) Pad or block sharp corners.
- 3) Lift and lower loads slowly without jerking.
- 4) Use slings of adequate capacity and construction. Consult the specifications.

6.12.4 Signs of Defective Wire Rope Slings

- Ten randomly broken wires in one rope lay or five broken wires in one strand in one lay.
- Wearing or scraping of one-third of the original diameter of the outside wires.
- Kinking, gouging, or other damage.
- Evidence of corrosion or heat damage.
- End attachments that are cracked, rusted or deformed.
- Splices.

6.13 Welding, Burning and Cutting

Welding, burning, cutting, hot tapping and other types of hot work are strictly prohibited by unauthorized persons. Welders should be adequately trained.

The bridge must be informed before commencing and after finishing hot work. "Permit to Work" requirements should be reviewed prior to commencing work.

Hot work around streamer reels requires extra precautions.

6.13.1 General Safe Practices

- 1) Welding leads should be completely insulated and in good condition.
- 2) Cutting tool hoses should be leak free and equipped with proper fittings, gauges, regulators and flashback arrestors.
- 3) Oxygen and acetylene bottles should be secured in a safe, place. Storage should be in a well-ventilated location out of direct sunlight with the two gases separated by adequate distance or adequate steel barrier. Consult manufacturers and distributors' guide lines
- 4) The person carrying out the work should ensure that any fuel oil/kerosene tank vents or openings are suitably protected against any hot metals entering. Cover cracks, holes and openings with fire retardant material.

- 5) The opening, draining or filling of streamer cables should not take place at the same time as any hot work.
- 6) Personal Protective Equipment (PPE) work boots, gloves, fire retardant clothing and goggles and face shields and welding cap must be used.
- 7) Check both sides of a bulkhead and know what is under any deck area (i.e., fuel tanks) before beginning any welding or cutting.
- 8) When welding or cutting is necessary in hazardous areas, one person should stand a fire watch with a fire extinguisher and necessary fire hoses readily available. Care should be taken to prevent sparks from starting fires. Additional fire watches should also be used in adjacent compartments where heat may travel by conduction through bulkheads, etc.
- 9) Welding and cutting areas should be checked periodically for a combustible atmosphere.
- 10) Do not weld, cut or perform any hot work on or around (above) a reel while a streamer is on the reel, unless the streamer is properly covered and protected.
- 11) Unused gas cylinders should be removed from the welding and cutting area, securely stored in a well ventilated area with valves closed, valve protection cap in place and clearly marked "M/T".
- 12) Hoses and welding cables should be kept out of hatchways and away from other workers. If a hose is flattened, a flashback may occur.
- 13) If flammable gas is detected, welding or cutting operations should be shut down immediately.
- 14) Hot metal should be marked with a sign or other warning when welding is complete.
- 15) Perform all welding or cutting operations upwind of a potential vapor release.
- 16) All welding operations should be performed according to authorized procedures.
- 17) Fire watches should remain in place until work areas have returned to ambient temperatures.

6.13.2 Acetylene (Gas) Welding and Cutting Tools

The following precautions should be taken with gas welding and cutting equipment.

- 1) Only qualified employees may use welding and cutting equipment.
- 2) Close cylinder valves when work is finished, the cylinder is moved or the cylinder is empty.
- 3) Repair, replace or clean dirty or defective hoses. Do NOT repair or tamper with cylinders, valves, regulators or flashback arrestors.
- 4) Do not interchange regulator or pressure gauges with other gas cylinders.
- 5) Keep cylinders in an upright position when in use.
- 6) Never use cylinders as rollers or supports.

- 7) Never use a match to ignite a welding torch. Always use an approved igniter.
- 8) Never heat a cylinder to raise the pressure.
- 9) Acetylene cylinders should be stored in an upright and secure position, with the discharge valve closed and the protective valve cover screwed on.

6.13.3 Electric Welding and Cutting Tools

The following precautions should be taken with electric welding and cutting tools.

- 1) Avoid welding in wet areas or conditions.
- 2) Store arc welding tools in areas free from combustible vapors.
- 3) Hood or screen arcs.
- 4) Wear proper eye protection.
- 5) Ground the frames or cases of arc welding equipment.
- 6) Keep welding cables away from hatchways and passageways to prevent trips and falls.
- 7) Replace welding cables that have damaged insulation or exposed conductors.
- 8) Avoid contact with grounded circuits when changing electrodes.

6.14 Portable Ladders and Scaffolds

- 1) Working from ladders should be avoided since there is a risk of overbalancing and falling. When working above 2 m (6 ft.), a Permit to work should be in place and a safety harness with a lifeline secured above the position of work should be worn. This should be secured to permanent structure and not the scaffold or ladder.
- 2) Use of ladders or scaffolds at sea should be avoided whenever possible, due to roll and pitch movement of the ship. Where their use is unavoidable, ladders and scaffolds should be secured top and bottom and fall prevention or arrest measures should be used.
- 3) If you have to climb, use a ladder. Make sure the ladder is designed to support the load it is intended to bear. Face the ladder when going up or down.
- 4) Always look up before positioning the ladder and climbing it. You will then be aware of any restrictions that will get in your way when you make the climb or objects on which you might hit your head.
- 5) A non-conducting ladder is recommended for use when working with electrical tools or any live electrical source. Keep rungs or steps tightened and free from oil, grease or any slippery substances.
- 6) Never stand on the top step or rung of any ladder.

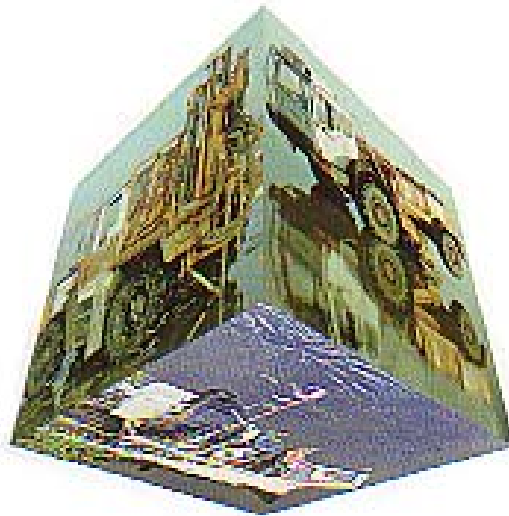
- 7) Secure the ladder on a firm and even surface. If the surface is smooth, use a skid-resistant material on the bottom of the ladder.
- 8) Discard any ladder that is cracked or bent.
- 9) Extension and straight ladders should be equipped with safety feet and rubber tips to prevent them from slipping.
- 10) Set the ladder's base 1/4 of the ladder's length away from the support against which the top is leaning. Set the ladder firmly before climbing. On ships, at sea or along side, you should block the bottom and secure the top.
- 11) Do not paint ladders. The paint can hide defects such as cracks. Use a good grade of varnish sparingly or use a mixture of linseed oil and turpentine to preserve the wood.
- 12) When you are on a ladder, do not over-reach; the ladder could slip or you could lose your balance. Get down off the ladder and move it to the proper position.
- 13) All stepladders must be equipped with locking bars and must be locked in place before use.
- 14) Stepladders may not be used as straight ladders.
- 15) Inspect any ladder before use. A-frame stepladders must have spreaders in place before use.
- 16) If you use scaffolds, make sure all planks and other materials are free from knots and splits.
- 17) Make sure that the scaffolding can support the load it has to bear.
- 18) The flooring or base on which the scaffolding is placed must be firm and even.
- 19) Learn to erect a scaffold from a trained person.
- 20) Ensure that the ladder or scaffolding cannot come into contact with any overhead power lines, radio transmission lines or machinery that may move. If such access is required then the permit to work system and lockout/tagout system must be applied.
- 21) Planks should not be supported on the rungs of portable ladders used as a staging nor should the ladders be used horizontally for the same purpose.
- 22) Both hands are to be used while climbing or descending ladders. Use tool belts or pouches for carrying tools and other small objects. If gloves are worn, they should fit properly. Use extra care on ladders if gloves are worn or if hands are wet or greasy.

6.15 Chipping and Painting

- 1) Proper PPE must be worn during all chipping and painting operations. Eye protection and dusk mask should always be worn in addition to other required PPE.

- 2) When chipping or painting is taking place in the vicinity of machinery, care should be taken to ensure that the power supply is isolated and the machinery immobilized in such a way that it cannot be moved or started up inadvertently. Appropriate warning notices should be posted.
- 3) Paints may contain toxic or irritant substances such as lead; however, lead-free paints should be used when possible. Solvents may produce flammable and potential explosive vapors, which may also be toxic.
- 4) Correct paint should be used for specific tasks. If the manufacturer's instructions are not given on the container, it should be ascertained at the time of supply whether any special hazards may arise from the use of the paint and also whether special methods of application should be followed. This information may also be found on Material Safety Data Sheets (MSDS).
- 5) All paints and solvents should be returned to proper storage lockers when not being used.
- 6) Rust removers are acids and contact with the skin should be avoided. Eye protection and rubber gloves should be worn for splash protection.
- 7) If painting aloft or otherwise near ropes, care should be taken to avoid splashes of thinners, paints and rust removers on ropes, safety harnesses, lines, etc.
- 8) Interior and enclosed spaces should be well ventilated, both while painting is in progress and until the paint has dried.
- 9) There should be no smoking or use of naked lights in interior spaces during painting or until the paint has dried hard. Some vapors, even in low concentrations, may decompose into more harmful substances when inhaled with tobacco smoke.
- 10) Where appropriate, "Wet Paint" signs should be posted and remain until paint has dried.
- 11) Brushes, rollers and associated equipment should be cleaned at the first opportunity. Brushes and rollers should not be left soaking in solvents and rags should be disposed of promptly and correctly to reduce the risk of spontaneous combustion.

7. EMERGENCY PROCEDURES



7 EMERGENCY PROCEDURES

It is especially important that all offshore personnel make themselves aware of the emergency procedures on their own crew. This manual highlights general information for the survival of you and your shipmates. More detailed information about vessel specific Life Saving Appliances and Fire Fighting equipment shall be available onboard each vessel in the form of SOLAS Training Manual and Fire Fighting Training Manual (as per SOLAS requirements).

An 'abandon ship' life jacket must be available for each person in their cabin. Life jackets should not be donned until on the open deck.

There should be 100% more life jackets on board for the maximum number of crew and passengers stored at or near abandon ship muster stations. Additional life jackets must be available for bridge crew and engine room personnel and kept near the work areas.

7.1 Survival at Sea

All personnel working in the marine environment should have a valid offshore survival-training certificate.

7.1.1 Survival

- 1) Stay calm.
- 2) Protection can come in various forms such as extra clothing, gloves, hat or an extra Personal Flotation Device (PFD), as well as recognized lifesaving devices.
- 3) An enclosed lifeboat offers maximum protection if the need to evacuate arises.
- 4) Your PFD offers protection and flotation as well as insulation and should be worn on top of all other clothing.
- 5) Protect the body by wearing layers of clothing. If possible, wear a windproof and waterproof garment as the outer layer of clothing. Preserve your body heat whenever possible. If left unprotected, the head causes the highest heat loss; the back is second. Excessive body motion contributes to heat loss.

7.1.2 Detection (Colour, Light, Sound, Movement)

- 1) Signaling devices that can be used during the day are:
Sea dye, flare and smoke signal, mirror, parachute flare, whistle and smoke flares and Personal Locator Beacons.
- 2) Signaling devices that can be used at night are: Flashlight, night flare, chemical light, flare pistol, strobe light, whistle, pen flare, parachute flare, fluorescent markings and reflective tape.
- 3) Movement can attract attention. Waving the arms, splashing water and using material such as flags and other creative movements will contribute to attracting attention.

- 4) When in the water, keep together with the other survivors. The more people, floats, rafts, etc., that are bunched together; the easier they will be to detect.
- 5) When using pyrotechnics, remember to get on the downwind side of the craft and launch downwind.
- 6) Emergency Position Indicating Radio Beacon (EPIRB) and Emergency Locator Transmitter (ELT).
 - Emergency Position Indicating Radio Beacon (EPIRB) is a marine distress radio transmitter.
 - Emergency Locator Transmitter (ELT) is an aircraft distress transmitter.
 - Either automatically or manually transmits a distinctive tone on a frequency reserved worldwide for emergency purposes: 406 MHz.
 - These transmitters are small, waterproof and buoyant, self-righting and attached to a line.
 - The radios should be stored in a readily accessible location where they will not be subject to damage.
 - Once the transmitter is activated, leave it on until rescue is complete. It could seriously mislead the searching aircraft if it is turned on and off.
 - Turn the transmitter off once the rescue is complete.
 - The signals can be detected from a range of up to 200 nautical miles. They are also detectable by satellite tracking and Search and Rescue (SAR) aircraft.
 - SART transponders (Search and rescue Radar Transponder) should also be carried to assist detection by rescue craft. Once interrogated by a radar signal from the rescue craft the SART will respond.
 - Test the batteries as per the manufacturer's recommendation.

7.1.3 Food and Water

- 1) Water is the key to your survival; therefore it is essential to conserve your water supply. This is particularly true in a long-term survival situation, a situation that rarely occurs with modern communication and technology.
- 2) Never drink salt water or urine.
- 3) No water should be consumed within the first 24 hours unless in a medical emergency situation. After that, not more than one pint (half a liter) daily should be allowed.
- 4) If possible, trap rain water or moisture (dew).
- 5) Use a desalting kit or solar still if it is available.
- 6) In the survival equipment packs, water may be found in cans or in metal foil or plastic pouches.

- 7) Seasick pills should be taken immediately after boarding the lifeboat/raft.
- 8) The food will be carbohydrate based. You may have a biscuit, wafer or possibly candy. Avoid eating protein (birds, fish) because the body will need more water to digest it.

7.1.4 Emergency Treatment

1) Know basic first aid for:

- Bleeding
- Hypothermia (cold) and hyperthermia (heat)
- Broken bones
- Respiratory arrest
- Shock
- Cardiac arrest
- Back injury

2) First aid information can be obtained from local authorities or company documents. *(See the final section of this manual for some basic procedures.)* Rescue

1) Vessel to vessel:

- Prepare for pick-up once the rescue craft has been spotted. Get signaling devices ready.
- Let the rescue craft come to you. Do not try to go to the craft.
- Notify the rescuer if anyone is injured.
- Climb a ladder, net or rope with the assistance of a safety line or belt.
- Keep your Personal Flotation Device (PFD) on at all times.
- Follow orders.

2) Vessel to helicopter:

- Let the helicopter come to you.
- The device that is lowered to you may have a static electric charge. Let the device ground out in water before you touch it.
- Priority should be given to those who have the most severe injuries or medical problems.
- Do not remove your (PFD), even when being lifted.

- Follow orders from helicopter crewmen. They will do the work for you.

7.1.5 Survival Suits

It is essential to receive training in the donning and use of survival suits. It is also essential to practice the correct donning of the survival suit that you have on your current vessel. If you jump into the sea wearing a survival suit, it is very important that the suit is worn properly fastened and the “hood” correctly worn covering the head. The air in the suit will be pressed out through the face lining. This may cause a dislocation of the lining and some water may enter the suit. It is important to press as much air out of the suit as possible before you jump.

Even if the suit is damaged and becomes swamped, it will render protection as a wet suit. It may, however, be virtually impossible to enter a survival craft with a water-filled suit even if you are assisted. It may become necessary to take off the suit or cut it so that water drains from the legs.

In most instances where the suit has become water filled, this has been due to inadequate tightening of the chin flap or inadequate closure of the zipper. If the face lining feels uncomfortably tight, it is a consolation to know that this is necessary to ensure a proper seal.

Even if the suit is well insulated, the use of warm clothing underneath will increase your survival time.

The suit will float a person on his back and swimming is best performed by butterfly backstroke i.e. both arms together.

The suit is provided with reflective tape and a “buddy line”.

7.2 Emergency Drills

The Master of the vessel is responsible for conducting drills as required by SOLAS.

7.2.1 General Rules

Every crew member shall participate in at least one abandon ship drill and one fire drill every month. The drills of the crew shall take place within 24 hours of the ship leaving a port if more than 25% of the crew has not participated in abandon ship and fire drills on board that particular ship in the previous month. (Taken from SOLAS)

All crew members and passengers aboard should be accounted for.

Only the minimum number of personnel essential for the operation should be excused from a drill. It is necessary, therefore, for drill times to be staggered to ensure that all personnel have attended a drill.

- Do not run
- Crew members should wear appropriate PPE for announced drills.

7.2.2 Alarm Signals

Alarm signals vary from vessel to vessel, however SOLAS standards should apply. Refer to station bills for definition of audible alarms.

7.2.3 Fire Drills

A fire drill should be held within 24 hours of the vessel sailing after a port call or crew change of more than 75% of crew complement. Fire drills should consist of simulated incidents and must include:

- 1) Checking the muster list.
- 2) Manning fire stations, equipment and apparatus.
- 3) Testing the fire pump by starting it and spraying water, testing nozzles at full pressure.
- 4) Recording complete details of drills including response time in the ship's official log and the safety report.

The Chief Officer is normally designated as Fire Chief and his duties include:

- 1) Coordinate with the Master for holding drills.
- 2) Choose the site and type of fire.
- 3) Ensure that training on firefighting equipment and appliances is given.
- 4) Ensure that maintenance work on the firefighting equipment is carried out.
- 5) Ensure that all fire equipment is inspected monthly.
- 6) Communications between scene and bridge.
- 7) Directing the fire team.
- 8) Looking to see any areas that need improving.
- 9) Answering any fire-related subject at safety meetings.

7.2.4 Manning Fire Stations

- 1) Trained fire fighters should dress in their fire fighting suits and then proceed to the fire site, only when given the order by their team leader.
- 2) Start the emergency fire pump and foam pump.
- 3) Deploy fire hoses in the area of simulated fire.
- 4) The first aid team should tend any simulated casualties.

7.2.5 Testing the Fire Pump

The fire pump(s) should be started and a sufficient number of outlets used to ascertain that the system is in proper working order. Normally the foam system should be off; however the system should be fully

tested for a short period at least once every three months. Fire hose nozzles should be tested to ensure that they could provide both jet and spray.

7.2.6 Man Overboard Drills

Man overboard drills are intended to familiarize all members of the crew with the necessary procedures required to locate and recover a man-overboard victim.

All persons aboard the ship should be instructed:

- In the deployment of the man overboard life raft, if fitted.
- In the use of the line throwers.
- In Man Overboard Boat (MOB) rescue procedures.
- Of the location and use of the life rings with rope, light and smoke.
- On their assigned man overboard station.

Man overboard drills should be performed simulating various operational conditions and should be practiced in as real a scenario as possible.

7.2.7 Abandon Ship Drills

Abandon ship drills should be held as required by local law or SOLAS standards. Each abandon ship drill should include:

- 1) The sounding of the alarm to summon personnel to their stations.
- 2) Personnel reporting to their designated stations and preparing for the duties specified in the muster list.
- 3) Checking that personnel are present and are suitably dressed. Warm clothing, with as many layers as possible, should be worn.
- 4) Checking that lifejackets and/or survival suits are correctly worn. Personnel in or close to their cabins at the time of the alarm should bring lifejackets and/or survival suits from their cabin stowage point.
- 5) If applicable, lowering but not necessarily launching of at least one lifeboat after any necessary pre-launch preparations, including davit inspection, operation and starting the lifeboat engine.
- 6) If applicable, preparing and exercising davit launched life raft.

Life boats should never be boarded during drills except when they are floating on the water.

Note; to review paragraph in light of the IMO Prevention of Accidents during Life Boat drills. Amend to SOLAS 2008 and 2006

Lifeboats should be launched with the assigned operating crew onboard and maneuvered in the water during an abandon ship drill when appropriate.

Where a vessel is equipped with a rescue craft that is not a lifeboat this craft should be launched each month as far as practical. Where a vessel's means of abandonment is provided solely by life rafts, the rescue craft role should include recovering personnel from the sea and gathering the rafts as necessary.

The emergency lighting for abandonment should be tested with each abandon ship drill.

7.3 Medical Emergency Evacuation Plan

Medical evacuation plans should be maintained for each operating area and operating condition. These plans should provide a means for communication to emergency services and transportation. Methods, routes and contingency plans for weather conditions - or when the primary plan fails - should also be established. Medical information and travel documents should accompany the patient.

Emergency preparedness exercises should be carried out on a regular basis and at the beginning of a new operation to verify that all evacuation plans are working and all contact names and numbers are checked.

7.4 Abandon Ship Procedures

In the event of an abandon ship emergency:

1. Muster at assigned stations.
2. Do not take personal belongings.
3. Check that all personnel are accounted for.
4. Do not abandon the vessel except under the Master's command and/or unless absolutely necessary.
5. If abandonment is required, the escape choices in order of preference are: lifeboat, life raft and life float. Lower life boat/life raft boarding ladders.
6. If time permits, launch the rescue craft.
7. Take on as many extra blankets, food and water as is feasible
8. Join all rescue craft and stay together if at all possible.
9. Avoid putting your body in the water. Only if all else fails should you enter the water.
 - a. An important factor in making a safe entry into the water is the distance from the water. The higher you are, the greater the chance of injury. Get as close as possible to the water before making the entry.
 - b. When entering the water:

- Look down. Make sure that you have a clear area in which to jump. Be aware of the sea state, wind direction and current. If an obstruction is below, move to the side rather than attempting to jump past it.
- Look straight ahead. Focus your eyes on a fixed point (the horizon). Do not enter the water looking down.
- Hold on and apply maximum pressure to your Lifejacket using your inner arms. Protect your face by covering your mouth and nose with one hand.
- Step off. Take a big step out away from the structure. Lock your legs together.
- After entry, move to a safe area as quickly as possible and group together with the other survivors awaiting rescue. Stay together if at all possible.
- Move clear if the vessel is sinking.

10. Do not re-board the ship unless given a verbal order from the Master.

7.5 Man Overboard Procedures

The Master will decide whether to launch the ship's Man Overboard Boat (MOB) and/or the rescue boat

In the event of a person falling overboard, prompt action is essential if the person's life is to be saved.

- Raise the alarm
- Throw lifebuoys and any other buoyant items that will aid in marking the position.
- Keep your eyes on the man in the water and point at him with extended arm.
- Shut down air gun firing. (It is recommended that this be automatically done when pushing the MOB button).
- The Bridge/ instrument room will take a position fix when the alarm sounds.
- Launch the Man Overboard Boat (MOB) under the Master's directions.

7.6 Marine Fire Protection and Fire Procedures

The marine vessel environment poses particular fire risks because of its confined nature and the hazardous flammable materials on board.

7.7 Fire and Emergency Stations

Fire and lifeboat stations are designated according to ship's Emergency Plan/Station Bill. These are posted at various locations.

7.8 Fire and Safety Plan

Fire and Safety Plans shows the general arrangement of the ship. This plan should include the following information for each deck:

- Location of machinery.
- Fuel tanks.
- Fire control stations.
- Fire detection systems.
- Fire alarm systems.
- Deck plans.
- Location of fire extinguisher appliances.
- Ventilating system including fan and damper positions.
- Identification numbers of fans serving each section.

These plans may be in booklet form to be issued to all key personnel and ship's officers.

A copy of these plans must be kept in a water tight container close to the gangway.



7.9 Fire Extinguishers



Fire extinguishers must be located around the ship in such positions and locations that they are readily available. At least one extinguisher, of a suitable type, should be positioned near the access door to the area it is designed to protect. The locations of fire extinguishers and their type should comply with all pertinent regulations and be approved by class. .

Each extinguisher must:

- Be suitable for the area that it protects.
- Have its instructions clearly visible
- Be clearly labeled as to the types of fire that it is suitable for.
- Have its location clearly marked.
- Be fully charged.

- Have its use indicator/inspection tag intact.
- Be readily accessible (not be obstructed).

Instruction should be given to all personnel in the use of all the types of fire extinguishers carried aboard the vessel. These instructions should include the type of fires for which each extinguisher is suitable and how to activate the extinguisher.

When activating a fire extinguisher, never stand directly above it; always tilt it away from your body to prevent injury in case of failure/explosion.

7.9.1 Foam Extinguishers

Foam fire extinguishers are highly effective for oil-related fires because of their ability to make water float on top of oil thereby starving oxygen from any oil fire. Foam is effective on both class A and class B fires. They should not be used on electrical fires due to the chance of electrocution. Some foam extinguishers are clearly marked where they are safe to use on electrical fires. However, always remember that the first course of action with such a fire is to cut the source of power.

Foam fire extinguishers or systems should be used to provide protection at the following locations:

- Streamer storage areas.
- Streamer work areas.
- Streamer oil pump.

Areas to be protected by the aqueous film-forming foam (AFFF) hoses/monitors include the helicopter deck and any area where there is potential for an oil-related fire.

7.9.2 Class D (Lithium) extinguishers

The CLASS D type 2 (Lithium) fire extinguisher is suitable for extinguishing lithium metal-based fires. CLASS D extinguishers work by interrupting the lithium's ability to complete the combustion cycle for itself.

Lithium-based fires burn at a temperature in excess of 650° C (1200° F) and normal fire extinguishers are of no use and may be dangerous.

CLASS D type 2 (Lithium) extinguishers should be located near streamer recovery areas, the lithium battery storage area.

7.10 Fixed Fire Fighting Systems (Gas Deluge Systems)

Protected areas should be able to have all ventilation fans and access openings completely sealed, fitted with alarm system separate from all other alarm systems and are clearly marked. Some deluge systems are toxic and should be labeled "Discharge - Evacuate Area Immediately."

The discharge control should:

- 1) Be situated in an area outside the compartment and easy to operate with regard to the safety of personnel in the compartment.
- 2) Have an alarm fitted so that when access to the discharge handle is gained it is triggered.
- 3) Be manually operated only.

The system should be fitted with gauges to each of its containers to allow for the stored gas level to be monitored.

When required to be operated (discharged), the system should:

- 1) Be activated only with permission.
- 2) Sound an alarm in the protected area for a suitable period of time before discharging its gas.
- 3) Activate visual and audible alarms on the bridge.
- 4) Stop all diesel powered engines with the sole exception of the emergency fire pumps.
- 5) Rapidly discharge its entire extinguishing agent.
- 6) Automatically shut down all ventilation fans.
- 7) After operation, the area should remain sealed in accordance with manufacturers' specifications, or until such time as all indications show that the temperature of all hot spots is less than the ignition temperature of any fuel or solvents stored in the protected area. On entering a protected area after agents have been discharged, do so from the highest, most easily accessible level wearing a self contained breathing apparatus (SCBA). A standby self-contained breathing apparatus (SCBA) team should be in immediate readiness. A first aid team equipped with a stretcher and oxygen should be ready. The oxygen must not be taken into the protected area or its immediate vicinity.

7.10.1 Hi-Fog Extinguishing Systems

This is another alternative fixed fire fighting system for use on vessels. It uses the principal of a high-pressure water mist to interfere with the combustion cycle. Its advantages are that water required to extinguish a fire is far less (and hence, less damaging to equipment) than the conventional sprinkler systems used on older installations. These systems are generally maintained and inspected under the class inspections of the vessel.

7.10.2 CO₂ and other extinguishing systems

The most commonly utilized fixed fire fighting system for machinery spaces is CO₂. The properties of CO₂ make it extremely effective for extinguishing a fire as well minimizing any potential environmental impact. Other alternative gas based systems (e.g. – FM200, etc.) are available and in use. All should be maintained and operated according to the manufacturers specifications.

7.10.3 AFFF Deluge System



The aqueous film-forming foam (AFFF) deluge systems should consist of:

- 1) A diesel-driven pump able to be remotely started from the Navigation Bridge and fire control point. It must not be one of the emergency fire pumps.
- 2) At least two foam hoses located so that at least one can be reached in the event of a fire. A nozzle capable of providing a water jet, spray or fog fitted at all times.
- 3) Deluge outlets located in such a manner as to cover the area being protected with an even blanket of foam. They should be inspected monthly.
- 4) Red storage tanks to hold enough foam so that a coverage of at least a 200 mm (8 in.) blanket of foam can be laid across the largest protected area, or so that at least 10 minutes of foam is available when two foam hoses are being used at the same time, whichever is greater. The expiration date of the foam in the tank should be clearly painted on the tank.
- 5) All control valves clearly marked describing their function. A simple flow diagram should be located beside the control valves showing their function. Except for drills, the foam valve should be left in the ON position at all times.

Areas to be covered by an aqueous film-forming foam (AFFF) deluge include:

- Streamer reels.
- Internal streamer storage areas.
- Compressors if not protected by other deluge systems.
- Helidecks.

The system should be tested regularly without foam. An air test is acceptable for this purpose. It should be tested for a short period with foam at least once every three months. The system should have sufficient spare aqueous film-forming foam (AFFF) liquid to allow the foam tanks to be completely refilled if empty.

7.10.4 Halons

Because of the possible damage to the environment by released fluorocarbons, Halon is no longer being manufactured and is considered illegal in many countries.

All new builds and upgrades no longer use Halon.

7.11 Fixed Detection System

Automatic fire and smoke detectors of a type suitable for the area being protected should be located throughout the ship. They should be connected to a control panel on the bridge that is capable of giving a visual and audible signal, showing from which section of the ship the alarm was triggered.

Fire and/or smoke detectors (which can also include flame & heat detectors) should be located in all stairwells, corridors, escape routes from accommodation spaces, high fire-risk locations and all living quarters.

Manually operated call stations or boxes should be installed in accommodation spaces, service spaces and control spaces.

The fire detection sectors should be arranged so that:

- 1) No sector covers more than one deck level.
- 2) No sector includes both machinery space and accommodation.
- 3) No sector includes more than one machinery space.

Fire detection systems should:

- 1) Be capable of being powered by two independent power sources.
- 2) Be capable of automatically switching power sources in the event of failure of one.
- 3) Have an indicator panel in the bridge.
- 4) Have a simple plan to show where each sector is located.
- 5) Be capable of detecting the failure of a sensor.

Fire and/or smoke detectors should be tested weekly and after every time an alarm condition, real or false, has been detected. Detectors should be clearly identified by number to facilitate this process.

7.12 Disabling of Fire Alarms

If it is necessary to disable the ship's fire alarm system in the immediate work area, permission must be obtained from the officer on watch. A Permit to Work should be filled in. This permission will be given in writing for a specified time period. The original permission should be posted at the fire alarm station. On completion of the work, the officer on watch should be informed. The officer will remove the posted permit and reset the alarms, either upon notification of work completion, or the expiration of the specified time period, whichever comes first. It is the duty and responsibility of the person carrying out the work to ensure that the officer on watch has reset the alarms as soon as possible after completion of the work. The crew should be especially alert for fires during the period the fire alarm is disabled. In the event that alarms have to be reset while a PTW for hot work is still active the officer of the watch immediately initiates investigation of the status of the ongoing hot work.

7.13 Fire Hoses

Fire hoses should conform to the vessel's flag of registry requirements and at a minimum:

- 1) Reach every area onboard the ship
- 2) Be of a suitable material.
- 3) Be fitted with suitable couplings.
- 4) Be stored beside its hydrant in a conspicuous position.
- 5) Have stored beside it any required tools or fittings.
- 6) Have the same diameter and couplings throughout the ship.
- 7) Have a suitable nozzle stored beside it.
- 8) All nozzles should be capable of supplying both a water jet and spray, and incorporate a shutoff valve.

After any hose has been used for emergencies or drills, it should be emptied of water and rolled up in such a fashion as to be readily available. All hoses should be pressure tested and inspected.

7.14 Fire Fighting

The Master has overall responsibility and coordinates all activities according to his judgment of the total situation.

He will issue the emergency messages and notification to be dispatched, call for any possible outside assistance or order the ship abandoned.

The Chief Officer is his deputy and is responsible for coordinating all activities concerned with the fire fighting fire teams, technical fire teams and different operations that have to be executed during an emergency. He reports directly to the Master. The Chief Engineer is responsible for fire fighting in the engine room, compressor room and all other machinery spaces.

General precautions:

- 1) Upon detection or suspicion of fire, immediately raise fire alarm and request help.
- 2) Try to extinguish the fire with the use of hand-held extinguishers, blankets, clothing or other similar items if it is safe to do so.
- 3) Search the surrounding area for people overcome by smoke or trapped by the fire. If rescue is impossible due to fire or smoke, report immediately to the bridge for help.
- 4) If unsuccessful, seal off all openings feeding air to the area to prevent spreading of the fire.
- 5) If possible do not open doors or hatches that may supply air to the fires and cause a back draught.

- 6) Be aware that smoldering fires develop poisonous gases that are odorless and invisible.
- 7) When an alarm is raised, all personnel must immediately report to their muster station in order to stand by for firefighting/searching efforts establish if anyone is missing.
- 8) When a fire alarm sounds, observe any orders or information given on the public address (PA) system.
- 9) When the fire suppression gases alarm is sounded, evacuate the area immediately. All personnel should report to their assigned muster station. If any person is trapped in the area, it must be reported to the Master/Bridge immediately. Do not re-enter area until the master gives permission.
- 10) Maintain a fire watch after the fire is extinguished to watch for possible re-ignition.

8. HELICOPTERS



8 HELICOPTERS

8.1 General

Helicopters enable us to work in normally inaccessible areas. Since safety depends on communication and education, safety meetings must be held frequently with all crew members. Each new crew member must receive a complete safety briefing before beginning any operational work with or around helicopters. It is essential to have a good understanding of hazards and to follow safe, consistent practices when using helicopters.

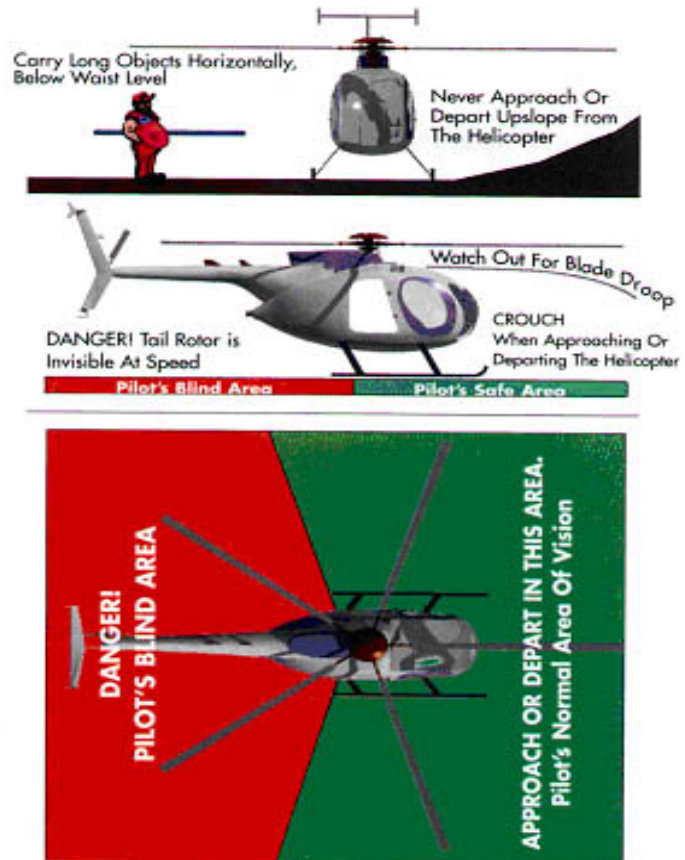
There are two rotor assemblies on a helicopter: the main rotor and the tail rotor. Some helicopters are now coming into service without a tail rotor and are referred to as NOTAR (NO Tail Rotor). These operate using a compressed air induced aerofoil along the tail boom that provides the same control.

The main rotor rotates in an almost horizontal plane. It provides the lift required for flight and creates a strong rotor downwash on takeoff and landing. This blast of air can blow hard hats, plywood, sheet metal or any other lightweight material around a landing area causing injury to people and damage to the helicopter. On flat ground, the main rotor blades can also "droop" dangerously close to the ground on landing and when the helicopter is being shut down.

The tail rotor is a high-speed propeller and, unlike the main rotor, is almost invisible when operating. It operates perpendicular to the ground either at chest or head height and has its own rotor wash. Other potential hazards are hot gases from exhausts and excessive noise. All these factors, plus the fact that people are not accustomed to a propeller on the tail of an aircraft, make the tail rotor extremely hazardous. No one should approach a working helicopter without a comprehensive briefing. Stay in direct eyesight of the pilot at all times and approach the helicopter as directed by the pilot. Never approach from the rear.

8.2 Training

All personnel must receive training in helicopter operations. This training will include the location of survival equipment, all the exits, both normal and emergency and a brief explanation of emergency locator transmitters and the operation of all the exits. Personnel that are going to fly offshore to or from



a geophysical operation must have Helicopter Underwater Escape Training (HUET) and dry landing emergency training. There is ongoing development regarding provision of miniature breathing and re-breathing equipment to aid escape from helicopters under water. Industry requirements have not been decided in this respect but most European training institutes do offer instruction in the equipment that is available

8.3 Pre-Flight Preparation

The following pre-flight preparations should be completed by the helicopter company and the vessel owner/operator. Helicopter landing decks are subject to regulation and approval. However, prior to helicopter operations to any vessel an inspection of the helicopter landing deck is sometimes made by a representative of the helicopter company.

8.3.1 Helicopter Operator provided information

- 1) Type of helicopter, weight, overall length including the D-value and wheels or skids.
- 2) Operating radio frequency of the helicopter.
- 3) Call sign of the helicopter.
- 4) Estimated time of departure and arrival of the helicopter.
- 5) Helideck surface requirements, e.g., with or without net, size, etc.
- 6) Pitch, roll and heave limits of the helicopter.

8.3.2 Vessel operator provided information

- 1) Description of the ship's helideck surface, dimensions and obstructions (cranes, antenna, etc.).
- 2) Actual weather report in the area and the vessel's pitch, roll, and heave information.
- 3) The ability to monitor the working radio frequency of the helicopter to and from the vessel.
- 4) A position report of the vessel, including operational status.
- 5) Details of the vessel's non-directional beacon (NDB) frequency and code.
- 6) Details of other installations in the area with vessel's non-directional beacon (NDB) frequencies and code.
- 7) Details of any other navigation assistance, such as the range and bearing from vessel's non-directional beacon (NDB) or VHF Omni-Directional Radio Range (VOR/DME) stations ashore.
- 8) The obstacle-free angle of the helideck.
- 9) Any refueling facilities in the area, alternate emergency landing sites (rigs, platforms, islands, etc.) in the area.
- 10) Number of passengers and weight of baggage and cargo. Weights should be determined with scales on board the vessel.

- 11) In an emergency evacuation, give the extent of injuries or illness, number of stretcher cases and number of walking casualties, as well as emergency care location if known.
- 12) The D-value (diameter in meters of the landing circle on the helideck).

8.4 Prior to Departure from Helibase

- 1) When the helicopter type is known, brief the passengers with the following safety instructions:
 - a. All persons flying in any helicopter will be under the direct command of the helicopter's flight crew. While on the ship, prior to boarding and after disembarking from the helicopter, they will be under the control of the ship's designated helicopter landing officer (HLO).
 - b. No person, unless otherwise directed by the HLO, will approach the helicopter while its red flashing anti-collision light is on. All personnel must avoid the tail and any air intakes of the helicopter.
 - c. No person should wear any unsecured objects, such as hats, that may be blown away in the down draft from the helicopter's rotors if they are running. HLOs must ensure that their hard hats have chin straps and are used.
 - d. All persons approaching the helicopter must approach in such a manner that the flight crew can see them. The forward rotors of some helicopters dip low at the front and, therefore, personnel should not approach from directly ahead. Be aware of high winds which can cause the blade to dip in any direction. All personnel should crouch when entering the main rotor disc area, no matter how high the rotor.
 - e. All persons flying in helicopters must wear seat belts, ear protectors and approved Personal Flotation Devices (PFDs); these may take the form of inflatable life jackets or of flotation suits. NOTE: inflatable life jackets for use in helicopters will always be manually operated, not automatic.
 - f. Where available all persons flying in helicopters should be familiar with re-breather devices.
 - g. All helicopter passengers should familiarize themselves with the helicopter's emergency exits and emergency equipment locations. This information will be made available to all helicopter passengers during the pre-flight briefing, and can also be reviewed with the laminated safety cards.
 - h. Upon landing, all passengers must stay seated with their seat belts fastened until instructed by the flight crew that it is safe to leave the helicopter. All safety equipment should be returned immediately to the helicopter for use by future passengers unless instructed otherwise.
- 2) Brief the cargo handlers on the type of helicopter to expect. One man will be nominated to ensure that the cargo doors are opened and closed correctly. The cargo handlers should also be familiar with the lashing points of the helicopter.
- 3) Check that the helideck and surrounding deck are clear of equipment and loose objects.

- 4) Ensure that the ship's crane is stowed and secured in the lowered position.
- 5) Ensure that the work boat and its protective cover are securely lashed if applicable.
- 6) Alert the MOB crew to prepare for helicopter arrival.
- 7) Connect and ready the firefighting equipment and protective clothing for fire fighters.
- 8) For emergency night operations, check the landing lights and floodlights.
- 9) Check the serviceability of communications, e.g., radio and vessel's non-directional beacon (NDB).
- 10) Inform air traffic control of nearby installations or rigs in the area of the intended helicopter movements.

8.5 Enroute to Vessel



- 1) Maintain communication with the enroute helicopter.
- 2) Contact the enroute helicopter as soon as possible after Estimated Time of Departure (ETD). The full call sign for the helicopter should be used. The call sign can be abbreviated to the first and last two letters once contact has been made, unless other aircraft with the same last two letters are operating in the area.
- 3) Inform the helicopter of the vessel's non-directional beacon (NDB) frequency, the call sign and when it will be activated.
- 4) Inform the helicopter of the vessel's present position with speed and heading.
- 5) With visual contact of the helicopter established and with a positive identification of the vessel by the pilot, request the pilot to QSY (change vessel frequency for landing clearance). The frequency should be acknowledged by the pilot before changing. The above procedure should be carried out with the helicopter within a 3 km (two mile) radius of the vessel. Usually the same frequency is used for the whole operation, and there would then be no change of frequency for landing.

8.6 Deck Crew

- 1) The minimum deck crew will consist of:
 - a. One Helicopter Landing Officer (HLO).
 - b. At least one trained firemen in a protective suit and breathing apparatus.

- c. One baggage handler (depending on the quantity of freight).
 - d. One fire valve attendant.
 - e. Loaders as appropriate. There will not be any other personnel in the area.
- 2) Prior to landing, the deck crew will take up the following positions:
- f. The HLO and the fireman with a clear but protected view of the helideck.
 - g. The baggage handler(s) protected behind cover with the HLO in sight.
- 3) Spectators should remain well clear of the helideck area.

8.7 Deck Equipment



The following equipment should be immediately available during all helicopter traffic:

1) Fire Extinguisher.

One or more dry-powder extinguishers with a total capacity of 45 kg (100 lb.) and one or more gas fire extinguishers (CO₂) with a total capacity of 18 kg (45 lb.) should be available near to the helicopter landing area. The ship's Aqueous Film-Forming Foam (AFFF) system must be able to provide foam to all points of the helicopter landing area from two hoses/monitors, each on its own branch line.

2) Total Fire Protection Fire Suit

Total fire protection suits, approved for such service, should be provided. This suit should cover the entire surface of the wearer but allow for self-contained breathing apparatus equipment to be worn. The suit should include:

- a. Total head and neck hood.
- b. Nomex or similar balaclava.
- c. Jacket and trousers or one piece suit.
- d. Gloves that can be attached to the jacket sleeves.
- e. Boots.
- f. A conventional fireman's suit from one of the firemen's lockers should also be immediately available.

3) Crash box

Large Axe, bolt croppers, heavy duty hacksaw with spare blades, seat belt cutting knives, grab hook with a long handle or line, 24 inch/60cm bolt croppers, flameproof gloves, adjustable spanner, side cutting pliers, assorted screwdrivers stored in the emergency equipment box, should be checked and the box left unlocked with the lid closed.

4) Ladder

In addition, two of the following from the fireman's lockers should be immediately available:

- a. Self Contained Breathing Apparatus (SCBA) system.
- b. Fireman's axe and pry/crow bar.
- c. Safety harness.
- d. Fireproof lifeline.
- e. Battery-operated, hand - held lantern.
- f. Fire blanket

5) Wind sock or other wind direction indicator.

6) Static hook.

8.8 Landing on Vessel



1) The HLO has the responsibility to ensure the helipad and area are clear to accept a helicopter and that the required minimum equipment is on board and readily available.

2) The HLO will ask the flight crew prior to landing if they intend to shut the helicopter down on landing or if they intend to leave the rotor running. If the intent is to shut the helicopter down, then the Helicopter Landing Officer (HLO) should ensure that no one approaches the aircraft while the rotors are turning.

The HLO should check the following before landing clearance is given:

- a. The helideck area is clear of equipment and people.
- b. The landing lights are on.
- c. The fire fighter(s) are dressed in their protective clothing and that the firefighting equipment is ready for use.

- d. The lashings or chocks for the helicopter are ready if required.
 - e. The passengers are present and that they have been briefed.
 - f. The loaders are present and have been briefed and one person nominated as the helicopter cargo doorman.
 - g. The forward corner safety rails and ship's stern mast have been lowered. Depends on vessel configuration.
 - h. A man overboard boat (MOB), with briefed crew on standby, should be available and ready to launch during helicopter operations. A guard boat if available should be on stand-by.
 - i. Any cranes are stowed.
- 1) On hand over from the working frequency to landing frequency, the helicopter pilot will call for landing clearance, i.e. vessel name and call sign, one mile from the vessel. It is more usual for a prior agreed frequency to be used throughout the operation.
 - 2) No one should approach the helicopter until the pilot gives permission to the HLO, who will in turn instruct all others. This is normally done by switching off the flashing beacons or strobes, although this practice is not followed by all operators.

8.9 Fuelling Operations

All re-fuelling procedures should be agreed upon with the aircraft operator beforehand.

8.10 Prior to Take-Off from Vessel

- 1) The HLO will check that the helicopter doors have been shut correctly and that skids, wheels and tie downs are free and clear.
- 2) The HLO will check that the helideck is cleared of equipment, loose objects and that all personnel are clear of the deck.

8.11 After Take-Off

Maintain flight watch if required.

Maintain the helideck ready for landing until "Non Return Point" of the helicopter.

Helideck crew to inspect the Helideck and HLO to report to pilot if any objects/parts or liquids found that could have originated from the helicopter.

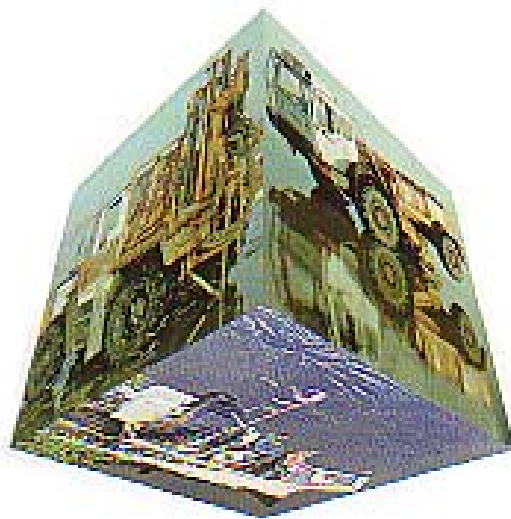
Helideck crew to stay on the Helideck until the departing helicopter can no longer be seen or heard.

8.12 Emergency Landing

In the event of an emergency landing, remain in your seat with your seat belt fastened. If the seat belts are unfastened, the motion of maneuvering for a landing may throw all passengers to one part of the cabin and cause the pilot to lose control.

- 1) Where appropriate, ensure that the survival suit is properly fastened.
- 2) Remove the ear protectors and spectacles.
- 3) Take up brace position before landing.
- 4) After impact, put one hand on the seat belt buckle and the other pointing to your exit door for orientation in case the helicopter inverts.
- 5) The man nearest the door is responsible for opening it when instructed by the pilot or as your HUET training dictates.
- 6) Do not release your seat belt until instructed by the pilot. If the helicopter sinks or inverts follow your HUET training.
- 7) Do not inflate the life jacket until you are clear of the helicopter.
- 8) Do not stand on inflated floats if the helicopter remains upright.
- 9) If the helicopter remains upright, await the pilot's commands to evacuate. There is great danger outside the helicopter until the rotors have ceased turning.
- 10) Remain with the helicopter as long as it remains afloat.
- 11) Remove life raft, flares, ELT (Emergency Locator Transmitter) and other survival equipment. Deploy Emergency Position Indicating Beacons (EPIRBs).
- 12) Assist those passengers or crew who may need help. Apply first aid as conditions allow.

9. FIRST AID



9 FIRST AID

The text has been changed to align with latest recommendations from UK Resuscitation Council which is the basis to many of the 1st and advanced aid training packages being provided.

<http://www.resus.org.uk/>

FIRST AID AWARENESS



What is First Aid:

First Aid is the assistance or treatment given to a casualty for any injury or sudden illness before the arrival of an ambulance or qualified medical expert. It may involve improvising with facilities and materials available at the time.

Aim of First Aid

First Aid treatment is given to a casualty in order:

- To preserve life
- To prevent the condition from worsening
- To promote recovery

PROTECT-EXAMINE-ALERT

You should assess the situation and

- 1) Protect
- 2) Examine
- 3) Alert



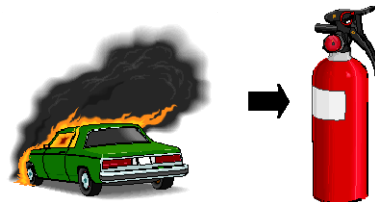
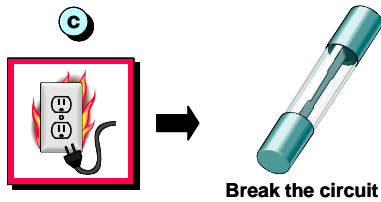
Only after having performed these 3 steps will you actually provide First Aid.

1. PROTECT

Protect yourself and the injured person

Avoid another accident by eliminating the cause:

- Turn-off the electricity to equipment
- Have someone control traffic
- Keep bystanders away from the scene of the accident
- Extinguish fire if possible without putting yourself in danger
- Protect yourself against blood borne pathogens (AIDS, Hepatitis)



2. EXAMINE THE VICTIM

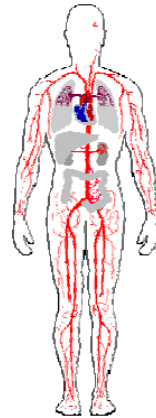
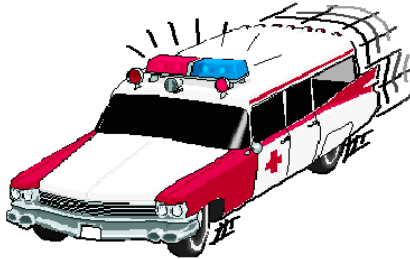


- A. Look for severe external **bleeding**
- B. Check for **responsiveness** and **unconsciousness**
- C. Check for **breathing**
- D. Check for **circulation**

2.1. EXAMINE

A. Look for severe external bleeding

- Loss of blood may be fatal
- Arterial bleeding from the femoral artery can cause death in two minutes!



2.2. EXAMINE

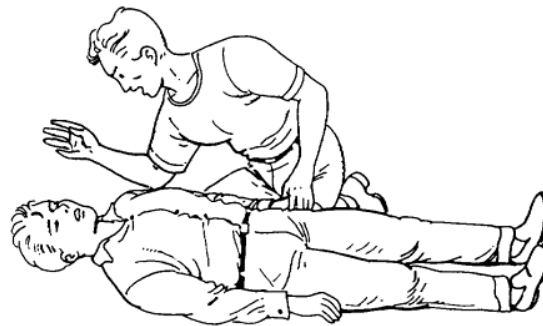
B. Check For Responsiveness/ Unconsciousness

Ask simple questions

“Can you hear me?”

Give simple orders

“Press my hand.”

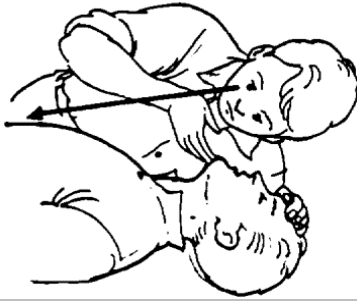


If there is no reply and no response, the victim is unconscious.

2.3. EXAMINE

C. Check For Breathing

Look – Listen - Feel



2.4. EXAMINE

D. Check Circulation/Pulse

Until recently, the rule was to check for the carotid pulse.

THIS IS NO LONGER THE RULE - This has now been abandoned in the revised First Aid international recommendations due to the fact that many first aiders were not able to find a pulse when faced with an emergency situation.

One should consider that there is no pulse if the victim:

1. is unconscious and
2. is not breathing and
3. has no reaction (coughing or body movements).

3. ALERT

Call for assistance or have someone alert the emergency medical service rapidly. Always provide:

- Exact location or address of the accident or incident
- Telephone number where you can be called
- How many people are involved
- Nature of injuries (fractures, burns, etc.)
- Indication of the seriousness of the injuries (breathing or not, etc.)
- What first aid has been given



Do not hang up until you are sure that the person at the other end has all the info and have them repeat the address to send assistance.

4. TREAT THE VICTIM

1. Control Blood Loss
2. Open the Airway
3. Give External Chest Compressions
4. Give Artificial Ventilations
5. Place in the Recovery Position
6. Keep under Observation



CPR

4.1. TREATING: Control Blood Loss

A. For important but non-complicated external bleeding:

Apply **direct pressure** on the wound.

Avoid direct contact with blood (gloves, gauze, handkerchief, etc.)



4.2. TREATING: Control Blood Loss

B. For important and complicated external bleeding (associated with a fracture or foreign body):

Use **indirect pressure**.

This requires applying pressure

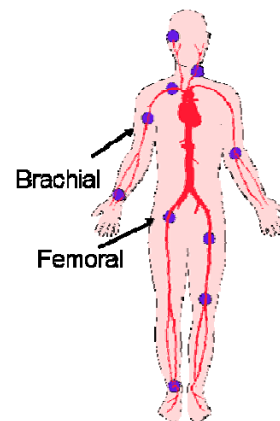
to the appropriate **pressure point**.

Brachial pressure point = Inner part of the upper arm

(Used to stop bleeding in hand, forearm and arm)

Femoral pressure point = Groin

(Used to stop bleeding in thigh, leg, foot)

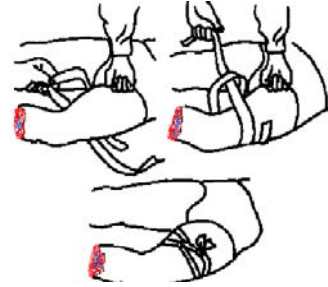


4.3. TREATING: Control Blood Loss

C. Tourniquet

Place a Tourniquet **ONLY** if:

- Bleeding is profuse and the pressure point is ineffective or impossible to achieve.
- You are alone and cannot apply a pressure point and perform CPR at the same time.
- There is no other choice as in the case of an amputated limb.



Lay the injured person down. Note the time at which the tourniquet was placed, and write it on his forehead.

NEVER REMOVE A TOURNIQUET ONCE IT HAS BEEN PLACED.

a. TREATING: Adult Basic CPR

Adult basic life support sequence

Basic life support consists of the following sequence of actions:

1. Make sure the victim, any bystanders, and you are safe.

2. Check the victim for a response.

- Gently shake his shoulders and ask loudly, 'Are you all right?'

3A. If he responds:

- Leave him in the position in which you find him provided there is no further danger.
- Try to find out what is wrong with him and get help if needed.
- Reassess him regularly.

3B. If he does not respond:

- Shout for help.
- Turn the victim onto his back and then open the airway using head tilt and chin lift:
 - Place your hand on his forehead and gently tilt his head back.
 - With your fingertips under the point of the victim's chin, lift the chin to open the airway.

Look – Listen - Feel



4. Keeping the airway open, look, listen, and feel for normal breathing.

- Look for chest movement.
- Listen at the victim's mouth for breath sounds.
- Feel for air on your cheek.

In the first few minutes after cardiac arrest, a victim may be barely breathing, or taking infrequent, noisy, gasps. This is often termed agonal breathing and should not be confused with normal breathing.

Look, listen, and feel for **no more** than **10 s** to determine if the victim is breathing normally. If you have any doubt whether breathing is normal, act as if it is **not** normal.

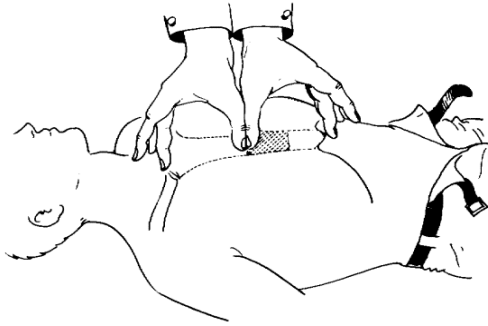
5A. If he is breathing normally:

- Turn him into the recovery position (**see below**).
- Summon help from the ambulance service by mobile phone. If this is not possible, send a bystander. Leave the victim only if no other way of obtaining help is possible.
- Continue to assess that breathing remains normal. If there is any doubt about the presence of normal breathing, start CPR (5B).

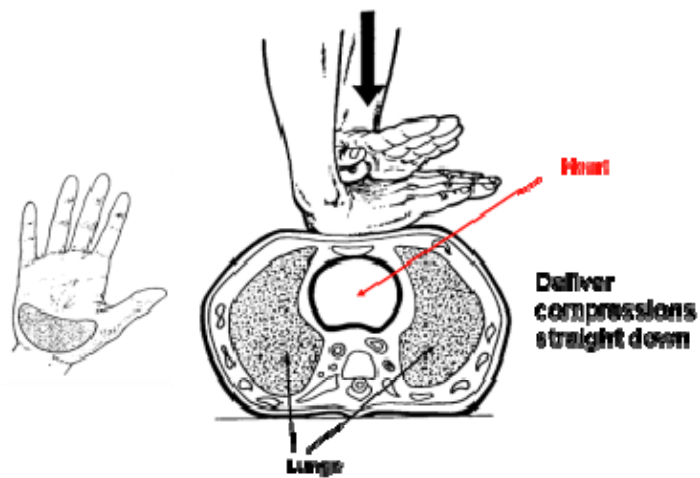
5B. If he is not breathing normally:

- Ask someone to call for an ambulance and bring an AED if available. If you are on your own, use your mobile phone to call for an ambulance. Leave the victim only when no other option exists for getting help.
- Start chest compression as follows:
 - Kneel by the side of the victim.
 - Place the heel of one hand in the centre of the victim's chest (which is the lower half of the victim's sternum (breastbone)).
 - Place the heel of your other hand on top of the first hand.
 - Interlock the fingers of your hands and ensure that pressure is not applied over the victim's ribs. Do not apply any pressure over the upper abdomen or the bottom end of the sternum.
 - Position yourself vertically above the victim's chest and, with your arms straight, press down on the sternum 5 - 6 cm.
 - After each compression, release all the pressure on the chest without losing contact between your hands and the sternum.

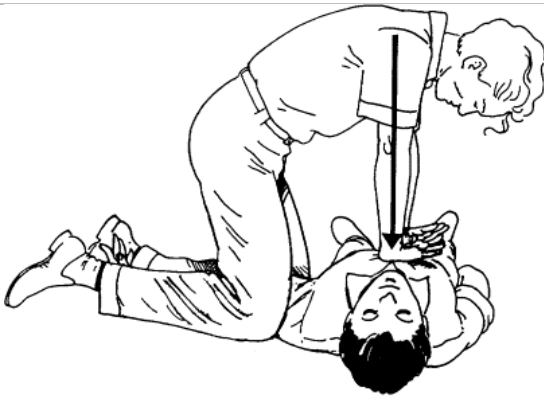
Locating the External Chest Compression site:
Center of the breastbone



Use the heel of the hand



ECC = 100 – 120 compressions per minute (adult)



Repeat at a rate of 100 - 120 min⁻¹.

- Compression and release should take an equal amount of time.

6A. Combine chest compression with rescue breaths:

- After 30 compressions open the airway again using head tilt and chin lift.
- Pinch the soft part of the victim's nose closed, using the index finger and thumb of your hand on his forehead.
- Allow his mouth to open, but maintain chin lift.
- Take a normal breath and place your lips around his mouth, making sure that you have a good seal.
- Blow steadily into his mouth whilst watching for his chest to rise; take about one second to make his chest rise as in normal breathing; this is an effective rescue breath.
- Maintaining head tilt and chin lift, take your mouth away from the victim and watch for his chest to fall as air comes out.
- Take another normal breath and blow into the victim's mouth once more to give a total of two effective rescue breaths. The two breaths should not take more than 5 s. Then return your hands without delay to the correct position on the sternum and give a further 30 chest compressions.
- Continue with chest compressions and rescue breaths in a ratio of 30:2.
- Stop to recheck the victim only if he starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally; otherwise **do not interrupt resuscitation**.

If the initial rescue breath of each sequence does not make the chest rise as in normal breathing, then, before your next attempt:

- Check the victim's mouth and remove any visible obstruction.
- Recheck that there is adequate head tilt and chin lift.
- Do not attempt more than two breaths each time before returning to chest compressions.

If there is more than one rescuer present, another should take over CPR about every 1-2 min to prevent fatigue. Ensure the minimum of delay during the changeover of rescuers, and do not interrupt chest compressions.

6B. Compression-only CPR

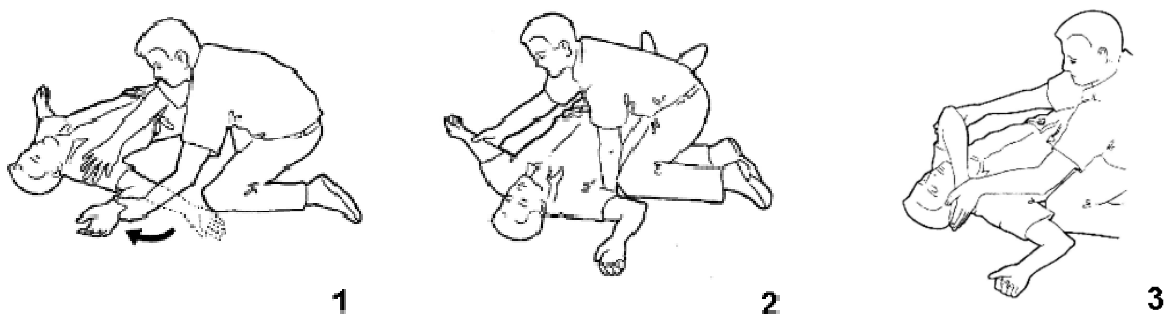
- If you are not trained to, or are unwilling to give rescue breaths, give chest compressions only.
- If chest compressions only are given, these should be continuous at a rate of 100 - 120 min⁻¹.
- Stop to recheck the victim only if he starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally; otherwise **do not interrupt resuscitation**.

7. Continue resuscitation until:

- qualified help arrives and takes over,
- the victim starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally, OR
- you become exhausted.

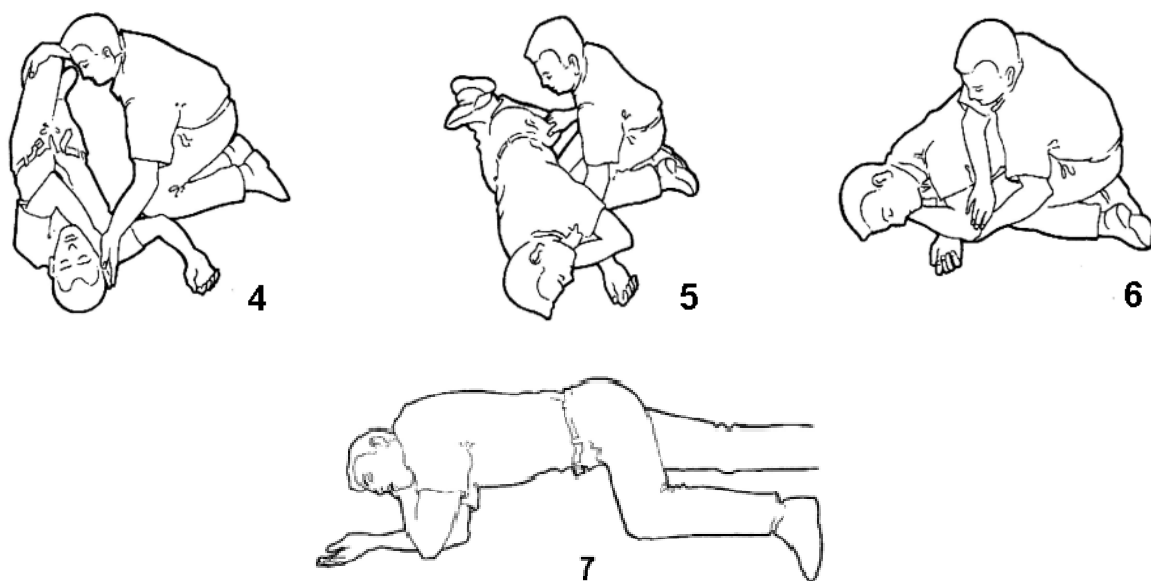
4.13. TREATING: The Recovery Position

For the unconscious casualty who is breathing and is reactive. Prevents obstruction of the airway by saliva or the tongue.



4.13. TREATING: The Recovery Position

The flexed leg is used as a control lever to facilitate body rotation.

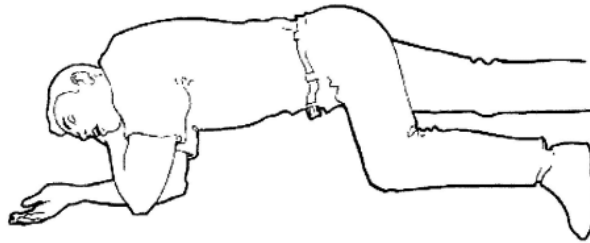


4.14. TREATING: Keep Under Observation

Check breathing, consciousness and reactivity every few minutes

Cover the victim with a blanket to keep him warm and avoid shock

Stay with the victim until emergency services arrive



5. OTHER BASIC THINGS TO KNOW

Other Injuries

- Choking
- Burns
- Fractures
- Bites

Moving the Casualty

- When?
- How?

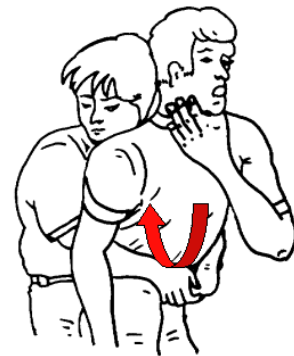
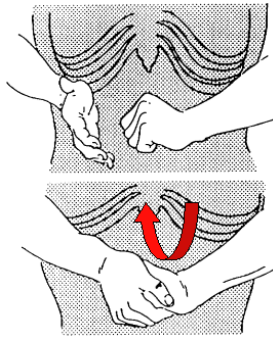


5.1. OTHER INJURIES: Choking

Choking = Airway obstruction

5 good taps on the back first

If no result => Heimlich Maneuver

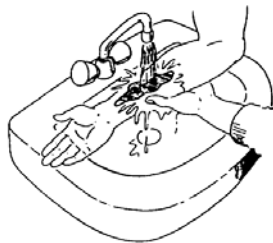


5.2. OTHER INJURIES: Burns

Thermal & Chemical Burns

Carefully remove clothing, especially when chemicals are involved.

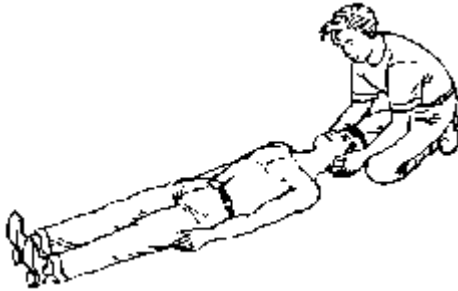
Cool the burnt area with cold water or other non-inflammable liquid (milk, etc.) for at least 10 minutes.



5.3. OTHER INJURIES: Fractures

Immobilize the fractured limb

Immobilize the head if a fracture of the neck is suspected

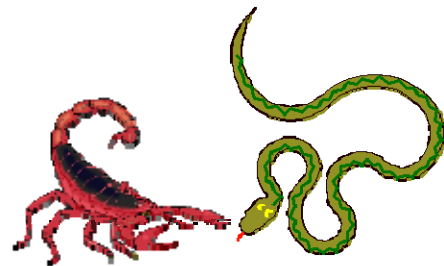


Whenever possible, never move an injured person before immobilization of fractured bone.

5.4. OTHER INJURIES: Bites

Snake bites and Scorpion stings

- Immobilize entire limb
- Calm the victim
- Advise the victim not to move
- Transport to medical facility
- Do not cut or suck wound
- Anti-snake venom should only be given by a doctor



5.5. MOVING A CASUALTY URGENTLY: When?

When?

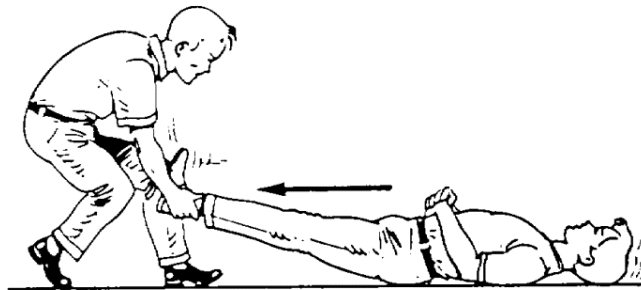
Only when the life of the injured person (and sometimes of the rescuer) is in greater danger than if not removed.



5.6. MOVING A CASUALTY: How?

If you are alone and there is a flat surface =

The Foot Drag



5.7. MOVING A CASUALTY: How?

If you are alone and there are obstacles on the ground =

The Wrist Drag



5.8. MOVING A CASUALTY: How?

If you are alone and need to get the victim out of the vehicle.

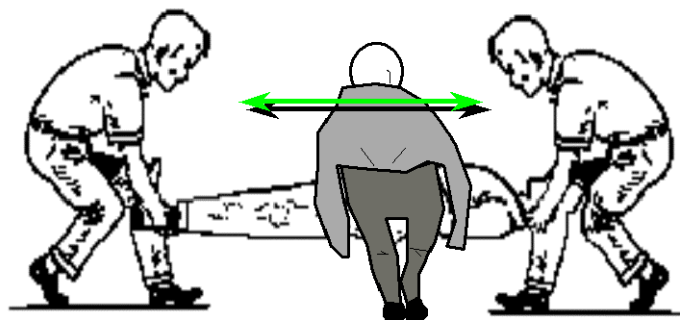


Switch off ignition.

Look at the car damage. It will indicate how severely the person is injured.

5.9. MOVING A CASUALTY: How?

If more than one first aider = **Move as a block**



Always ask yourself if it is really necessary to move the injured person?